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DECEMBER
1958

VOLUME 51
NUMBER 10

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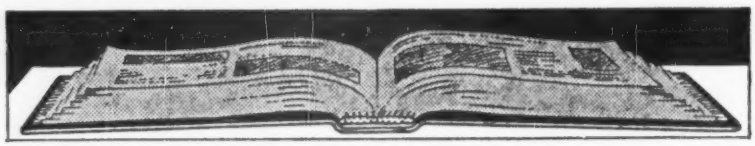

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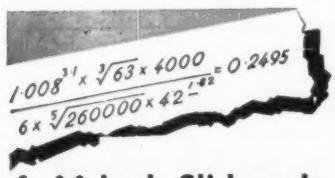

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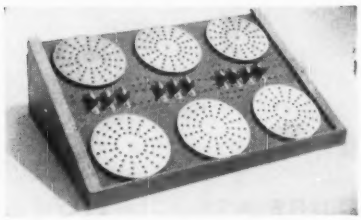

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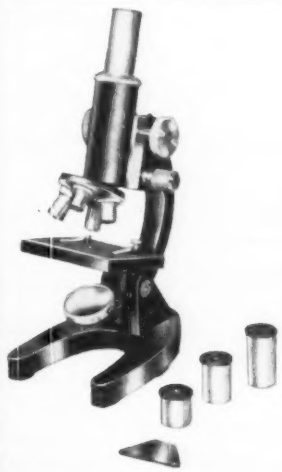

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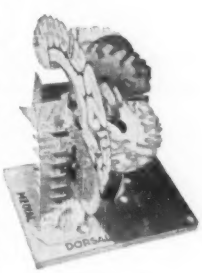

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Reviews

Marine Ecology

By Hilary B. Moore. New York. 1958. John Wiley and Sons. 493 pages. Illustrated. $9.50.

The ecology of the oceans is a vast subject. While much has been written in this area, this text brings together, organizes and appraises present-day knowledge of marine science. Dr. Moore was educated at University College, London, held several posts in marine biology in Great Britain and is now assistant director of the Marine Laboratory of the University of Miami and Research Associate for the Woods Hole Oceanographic Institution.

Woodland Ecology

By E. G. Neal. Cambridge, Mass. 1958. Harvard University Press. 117 pages. $1.75.

This little book is based mainly on the study of one woodland community over a period of four years. It is presented in a way to be of practical value to anyone wishing to "manage" such an area, as well as to the student of ecology.

Briefly Noted

Below the Surface. By Alice I. Hazeltine. New York. 1958. Abingdon Press. 223 pages. $3.95. Stories about men and women who adventure or work in mine, cave, under water or in search of lost treasure.

Looking at the Stars. By Michael W. Ovendon. New York. 1958. Philosophical Library. 192 pages. Illustrated. $4.75. Introduction to the heavens by a distinguished British astronomer.

Zoo Hunt in Ceylon. By Heinz Randow. New York. 1958. Doubleday and Co. 230 pages. $4.00. Story of adventures of the author and his wife collecting rare animals for zoos and circuses.

Science in a Tavern. By Charles S. Slichter. Madison, Wisconsin. 1958. University of Wisconsin Press. 206 pages. $1.00. A collection of essays and diversions on science in the making.

The Care and Breeding of Goldfish. By Anthony Evans. New York. 1958. Dover Publications. 82 pages. Illustrated. $.75. Practical guide for the goldfish hobbyist.

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Nature IN PRINT

By HOWARD ZAHNISER

Exponents Of Wilderness

TWO ARTICULATE EXPONENTS of wilderness—both of them among the fifteen members of The Wilderness Society's governing Council—have recently written significant books published within a few days of each other—*Arctic Wild* by Lois Crisler, published on September 17 by Harper and Brothers, and *Listening Point*, by Sigurd F. Olson, on September 22 by Alfred A. Knopf.

When national attention to wilderness preservation has been stimulated as never before by the urgency of the Wilderness Bill that is now being carried over from the 85th Congress to the new session to begin in January, such volumes of course have a special timeliness and current meaning for all who seek a better understanding of wilderness values and problems. Yet neither of these books deals with current events, even mentions pending legislation, or tries to tell readers what to do or say or think. Each testifies to deep personal experience, ponders the meaning of the experience with its observations and revelations, and comes to its reader as testimony and appreciation. Their pertinence is in their concern with what is basic and enduring.

Eighteen arctic months

Lois Crisler went with her husband, the skillful, sensitive wilderness and wildlife photographer Herb Crisler, on a mission to the northernmost and perhaps wildest part of the United States, for color motion picture films—some of which we have already seen represented in Walt Disney's "True-Life Adventure" called *White Wilderness*. With a winter interlude in Point Barrow, she lived eighteen months with her husband in the arctic wilderness of Alaska's Brooks Range—in an umbrella tent and then in a plywood hut they called the "crackerbox." Their human experiences are fascinating and exciting to share, in the tenseness of the photographer's fortunes on such a quest, their travels together and their separation as Herb pursued his photography, and their creation of a home in tent or plywood hut. Lois Crisler tells of all this, and the photographs in the book are an album to look at again and again. But the depth of value in her book—and it does have a profound importance—is in her apprehensions, her perception, of the wilderness itself, the wild expansive arctic wilderness, and her understanding of the wild creatures that make this a living wilderness. With a sympathy, an empathy, that bring consciousness of living companionship in the whole community of life, she comes to know fellow animals—wolves, wolverine, others—as few human beings have, and she knows them as inhabitants of wilderness.

Sigurd Olson, in a sense, testifies to the same vision, but he sees it, and perceives its sound effects, from a point near at hand to his Ely, Minnesota, home, a projection into the humanly cherished, preserved area of the wilderness canoe country of which he wrote once before in *The Singing Wilderness*. "Immensity of space," "grandeur of creation," "sense of wonder" are phrases in his philosophy which includes "the great concept that nothing stands alone and everything, no matter how small, is part of a greater whole." On and from a piece of land which has come into his own human possession and on which he has built himself a cabin, he seeks to learn, "from rocks and trees and all the life that is found there, truths that can encompass all." Through a vein of rose quartz he reads "the geological history of the planet, from an old pine stump the ecological succession of the plant kingdom, from an Indian legend the story of the dreams of all mankind."

"Laughing Lion," "Young Ottertail," "Broad-Wing," "Beaver Cutting," "Cock of the Woods," "The Spawning," Bobcat Trail" are titles of chapters interesting and charming that share with us a friendship with the wild creatures, and other essays in terms of interesting incident and reminiscent description express the nostalgia of old times, old characters, and such other real things as the sound of rain and paddles.

The wilderness, at last recognized as a human resource of deep value, Sigurd Olson knows and cherishes and interprets. "We must know the wild," he realizes, "and all it entails, the bite of a tumpline on the portages, the desperate battling on stormy lakes, the danger and roar of rapids and falls. We must know hunger and thirst and privation and the companionship of men on the outtrails of the world, for all these things are inseparable.

To wonder and dream

"As long as they remain, as long as there are any places left at all where man can still glimpse the unknown, he will be drawn irresistibly as he has been for ages past, and, seeing them, will wonder and dream and think long thoughts." Of this Sig Olson is sure, but he also senses and expounds an importance of wilderness even to those who do not experience it directly.

"The fact," he points out, "that few have any intimate physical contact with undeveloped country is unimportant. While traveling by canoe, packhorse, or on foot may be the ideal way to experience the wilds, the very existence of such areas affects those who see only its fringes or are aware that it exists at all. So ingrained in our consciousness, so intuitive is this reaction that even a suggestion of wilderness adds richness and color to experience."

"Men will always be drawn to the last frontiers," writes Mr. Olsen in the closing sentences of *Listening Point*, "where they can recapture some of the basic satisfactions and joys of the race, renew the sense of mystery and wonder and even some of the dreams their forebears had known.

Surely, indeed, Lois Crisler has demonstrated this in a vivid, even startling, way, and in addition she has shown also the value to all of us, although we stay close to cities and civilization, of the experiences that great wilderness still offers to those who do sojourn in it, although but for a time.

With an imagination and an eloquence that enable her to write, for example, of "pleasure like quiet ice water" flowing over the "narrow channel of distress," she brings to us the experience of arctic wild.

"All around rose the silent white mountains. Overhead the aurora moved in rectangles, parallel bright ropes and gliding curtains. My diaphragm had an eerie feeling of

flinching. All that moving, those presences, noiselessly creeping above me, each more beautiful than the last but giving the impression of something purposeful yet not—ineffably not—animal."

"I left the pancakes on the griddle to burn or not burn one morning and went outdoors just as the daily heart-stirring radiance of the sun glided from back of the mountain. All the way up Easter Creek each mountain was a light gray nothingness of shadow and would be for quiet hours yet. But far up the Killik those high lawns of the pass where we had summered were white, underscored with a blue slanting spear of shadow. Above the far side of them, the low blue mountains were cropped with sunlight. The air was so pure it seemed as if in four hours' walk one could be treading up there."

Out of the world

"The tundra is a world out of this world, a thin moss-and-lichen blanket spread over fathomless ice, beneath a sky where in summer the sun does not set and in winter does not rise, and the aurora speeds or drifts in ghostly white across the stars."

The great contribution, however, that Lois Crisler derives, for all of us who will appreciate, from her experience in the arctic wilderness she so vividly describes, is in what she reveals to us of its wild animals. "There was a miraculous fact about this deadly white wilderness," she exclaims, "it was alive! Animals lived here." Her book itself is alive with her breathing, sometimes breathless, living paragraphs about her experiences with these animals.

"People who have never dealt with wild animals may suppose my language exaggerated," she comments, and adds: "It is hard to imagine, if you have not experienced it, how fervent and intense wild animals may be in relation to a person."

"Fervent and intense" indeed were the relationships between Lois Crisler and the wolves of which she writes, and in what she writes of them are the supreme values of her experience and her testimony. "Wild Shepherds of the Caribou," she calls them in their arctic home. She and Herb Crisler, however, also brought wild young wolves into their own association, members as it were of the same household, and of them she writes intimately. "The wolves, our companions," she calls them and reveals a wolf character that is marvellous and precious, gentle and enviable.

"In a reasonable world these peaceful predators," she admonishes us, "would be the most cherished object of study by our race," for wolves, she declares, "have what it takes to live together in peace." This, she concludes, is the main fact about wolves. It grew on her slowly, but she explains even its particulars. "They communicate lavishly. . .They have the big three peace enablers: social observingness, social concern. . .social responsibility."

How poignant as one reads Lois Crisler's characterization of the wolf she knows is the realization of the false reputation men have given this animal! So poignant also is the sense of civilization's destructiveness for the living wilderness in which the true wolf lives, and the sincere human being still has the chance to know the truth.

As Lois Crisler herself sadly says, "There is a secret tension between love and despair in anyone nowadays who goes into wilderness with his eyes open. No carefree love of the planet is possible."

"Great wilderness," she has perceived, "has two characteristics: remoteness, and the presence of wild animals, in something like pristine variety and numbers. Remoteness cannot be imitated in cheap materials; and wilderness without animals is mere scenery."

"It looks," to Lois Crisler, "as if two movements are gaining their peak now: the power to wipe out our environment; the power to love it."

So also it looks to many of us, and to those of us who rejoice at the continuing generation of the power to love, Lois Crisler's *Arctic Wild* and Sigurd Olson's *Listening Point* are books of dynamic value and deep interest.

Arctic Wild. By Lois Crisler. New York: Harper & Brothers. 1958. xx+301 pp. (5¾ by 8-5/8 in.) with foreword by A. Starker Leopold, and 65 photographs on 32 plates. $4.95.

Listening Point. By Sigurd F. Olson. New York: Alfred A. Knopf. 1958. x+243 pp., 27 chapter-head drawings by Francis Lee Jaques, note on the author, and note on the type. $4.50.

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Reviews

A Field Guide to the Birds of Puerto Rico

By James B. McCandless. Mayaguez, Puerto Rico. 1958. Calle Post Esquina, El Bosque. 68 pages. $2.00.

Dr. McCandless is a physician with a deep interest in bird life and the opportunity to indulge it in an insular region rich in bird life. He has based his little guide on Roger Peterson's *Field Guide to the Birds*. Armed with Peterson's book and this supplement, any bird enthusiast visiting Puerto Rico will find himself well provided with the means to find and identify the avifauna there.

Birds of Maryland and the District of Columbia

By Robert E. Stewart and Chandler S. Robbins. Washington, D. C. 1958. U. S. Government Printing Office. 401 pages. $1.75.

This is a guide to where and when one might be expected to find birds in the middle-Atlantic area indicated by the title. It is not a field guide but a supplement to such a volume. It assembles information on avian distribution of Maryland and the District, and includes data on habitat, nesting, migration and status.

Learning about Soil and Water Conservation

By Adrian Fox and George Rotter, Lincoln, Nebraska. 1958. Johnson Publishing Company. 64 pages. Illustrated. 75 cents.

An efficient instructional tool in soil and water conservation for elementary and junior high school pupils. This is also excellent for correlation with the language arts or social sciences. This test-workbook outlines many rich and interesting experiences for children in city and town schools, as well as in rural schools. It promotes the practice of organizing ideas and provides space for setting them down in writing. The book includes an excellent thought-provoking picture section. The authors also have provided a teacher's manual with suggestions for use. H.E.R.

Briefly Noted

The Strangest Things in the World. By Thomas R. Henry. Washington 3, D. C. 1958. Public Affairs Press. 200 pages. $3.50.

An interesting compilation of paradoxes in Nature.

Hope S. Jex

DECEMBER'S AUTHORS

Bil Gilbert

In this issue Bil Gilbert, free-lance magazine and newspaper writer of Glen Echo, Maryland, brings our readers up to date on the modernization program of the Smithsonian Institution's great National Museum in Washington, D.C. Mr. Gilbert, who carries on a variety of editorial and public relations jobs in the industrial health and safety field, makes natural history subjects his first choice for articles. . .John D. Kendig, writing this month about Christmas trees, is well versed in his subject, having raised and sold the trees for a number of years around his home town of Manheim, Pennsylvania. . .Myron Sutton, a naturalist on the staff of the National Park Service, and his wife, Ann, collaborate in Nature writing and photography. They are presently stationed at Elgin, Illinois. . .John M. Mehrtens, of Dallas, Texas, is a free-lance writer and photographer who specializes in Nature subjects. Mr. Mehrtens formerly was curator of reptiles at the Columbus and Cleveland, Ohio, zoos. . . Hope Satterthwaite Jex, whose thirteen acres of farm-land sanctuary in the town of Mill River, Massachusetts, have furnished many a story for Nature Magazine in the past, is an enthusiastic conservation worker with a major interest in animals, studied both from the sentimental and scientific points of view. . .Leonard Lee Rue, III, a native of Paterson, New Jersey, has successfully combined an intense interest in the natural world with high-speed photography to produce many unusual articles on wildlife subjects. . .Lyn and Richard Harrington are a team of Canadian naturalists and photographers. . .Weldon F. Heald, of Tucson, Arizona, is a member of numerous conservation organizations, article writer, photographer, and active advocate of wilderness preservation. . .Ruth K. Stroh is a primary grade teacher who lives at Cockeysville, Maryland.

Shooting Stars. By Herbert S. Zim. New York. 1958. William Morrow and Co. 64 pages. Illustrated by Gustav Schrotter. $2.50. Discussion of meteors and meteorites for the younger reader.

Kangaroos. By Louis Darling. New York. 1958. William Morrow and Co. 64 pages. Illustrated by the author. $2.50. Habits and characteristics of kangaroos and other animals with pockets. For the younger reader.

The Fascinating World of Butterflies. Adapted by L. Hugh Newman from Charles Ferdinand's Les plus beaux Papillons. *New York. 1958. Doubleday and Co. 92 pages. Illustrated in color and black and white. $4.95.* This is a beautiful book on butterflies and primarily pictorial.

The Kodiak Bear. By Jim Woodworth. Harrisburg, Pa. 1958. The Stackpole Company. 204 pages. $5.00. The story of these great bears with quite a bit of emphasis on hunting.

The Atomic Age and Our Biological Future. By H. V. Brondsted. New York. 1958. Philosophical Library. 80 pages. $2.75. Popular discussion of effects of increasing use of atomic energy.

Our Nuclear Adventure. By D. G. Arnott. New York. 1958. Philosophical Library. 170 pages. $6.00. Discussion of the possibilities and perils of the nuclear age.

Elements of Mathematical Biology. By Alfred J. Lotka. New York. 1958. Dover Publications. 465 pages. $2.45. Application of modern mathematics to the problems of phylogeny, ontology, ecology, physiology, endrocrinology, psychology and other branches of biology.

The Garden of Chaparral. By Elizabeth M. Riess. New York. 1958. Vantage Press. 158 pages. Illustrated. $3.00. Introduction to the plants of the lower Rio Grande Valley by one who has devoted forty years to their study.

With a Task before Me. By Virginia S. Eifert. New York. 1958. Dodd, Mead and Co. 218 pages. Illustrated by Manning De V. Lee. $3.00. Fourth book in this Lincoln series by this author, a frequent contributor to *Nature Magazine*. This book deals with Lincoln's departure from Springfield, Illinois, for the years as President.

The Tarantula. By William J. Baerg. Laurence, Kansas. 1958. University of Kansas Press. 88 pages. Illustrated $3.00. Dr. Baerg has been a life-long student of the tarantula, has had many as pets and here tells the story of this spider.

The Animals of Doctor Schweitzer. By Jean Fritz. New York. 1958. Coward-McCann. Illustrated by Douglas Howland. $3.00. A story for the younger reader about the animal friends of Albert Schweitzer in Africa

Contents noted BY THE EDITOR

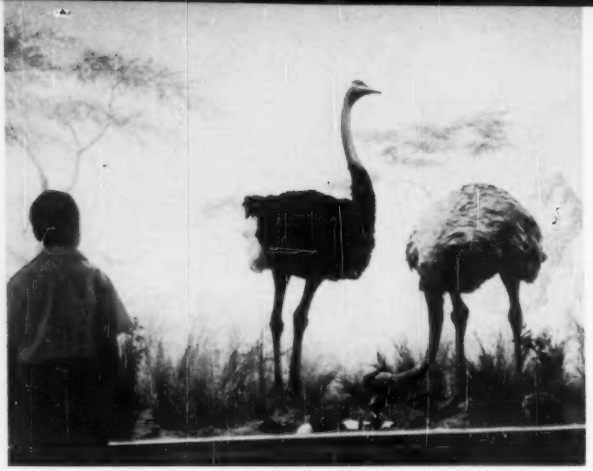
MARYLAND'S PERSISTENT INTRANSIGEANCE, so far as baiting wild ducks to the blinds is concerned, has at last been brought to an end by the Maryland Game and Inland Fish Commission. Ever since the Federal migratory bird hunting regulations included a ban on baiting—the deliberate placement of food materials to attract the birds within gunning range—Maryland has been loathe to go along with all the other States. The more criticism that resulted from this defiant course, the more stubborn the State's duck hunters and the State authorities seemed to become. A five-year-old baiting regulation of its own has prevailed until, at long last, the Maryland attorney-general's office ruled the State regulation illegal and ineffective. The ruling pointed out that, under the Migratory Bird Treaty Act, a State could adopt more restrictive rules than the Federal regulations, but not more liberal ones. This decision, along with the poorest flight of waterfowl along the Atlantic Flyway in a decade, finally brought an end to this problem.

MORE RESTRICTIVE BUT NOT MORE LIBERAL was the finding in the case of Maryland's duck baiting policy. This decision is interesting to consider in the light of the Federal law seeking to encourage control of outdoor advertising along the Interstate and Defense Highway system. Under the law, and the Federal standards promulgated under it, States must enact legislation at least conforming to the Federal prescription to receive benefit payments. However, nothing in the Act, or in the standards, requires the State to apply only these minimum requirements. Indeed, Maryland has enacted a billboard control law that is more restrictive, and other States have the legal opportunity to do likewise.

OPPONENTS OF THE WILDERNESS BILL seem to grasp at some fragile straws in seeking to prevent favorable consideration of this basically important measure. One that has recently been voiced is that the wilderness program should be pigeon-holed pending the studies of the new Outdoor Recreation Resources Review Commission. This to us, rather lame claim is well answered by Joseph W. Penfold, a member of the Commission. Rather than hinder the Commission's review, he asserts, it would vastly aid it if wilderness preservation is adopted as public policy by Congress. He adds: "The Wilderness Bill will not disturb any existing balances as to recreation resources. By providing a policy for the existing areas of wilderness that are already being handled as part of other and consistent programs, however, and providing for their continued administration by their present administrators, it will provide improved means for the Outdoor Recreation Resources Review Commission to use, both in its conduct of the study and in its preparation of the recommendations which it is expected to make to the Congress and the President."

LITTER AS A FOREST FIRE HAZARD is a phase of the litter problem that has not been given as much attention as it should have received. Now Smokey Bear has turned his beady eye to this question and says: "I'm Bitter about Litter. . A Litterbug May Be A Firebug!" Keep America Beautiful, Inc., which is fighting the litter problem, welcomes Smokey's collaboration. With growing use of forested areas, whether Federal, State or local, for recreational purposes, has come growing litter from our national outdoor bad manners. Accumulations of inflammable trash in places where people picnic, or otherwise leave their rubbish, can speed a forest fire on its way. The recent National Fire Prevention Week had as its 1958 slogan "Don't Give Fire a Place to Start." This goes for the forest, just as much as it does for myriad places where litter can and does abet the costly destruction of fires.

HAWK MOUNTAIN SANCTUARY ASSOCIATION was incorporated twenty years ago, and Mrs. C. N. Edge turned over to it, fully paid for, Hawk Mountain in Pennsylvania. Along its slopes migratory hawks pass on their southerly course in the autumn, and along this course they were traditionally met by a hail of shotgun fire. The two decades that have passed since Hawk Mountain became a symbol of protection and modern thinking about the place of these birds in the ecology of the air, have seen a great change in public attitude. More and more States have adopted laws protecting all hawks, except the occasional individual bird of a few species causing economic loss to a farmer. Pennsylvania has gone as far as protecting all hawks along the historic flyways of Pennsylvania during the fall migratory season. It is to be hoped that the Keystone State will soon fall in line with other eastern States in extending to all species, all-year protection. However, in coming as far as we have come in twenty years, we are certain that the example of Hawk Mountain has been a vital factor in changing public attitudes from blind prejudice to regulation based upon scientific knowledge. R.W.W.



Realism is the keynote for National Museum life groups.

New Look for the National Attic

EACH YEAR the Smithsonian Institution publishes a report of items that have been given, bought or collected during the previous year for the United States National Museum in Washington, D. C. The 1957 list, nearly 700,000 items in all, includes such accessions as—eight lice from South Africa; a blue satin theater program, vintage of 1892; four Polish ferns; thirteen bees from North Carolina; a plastic mold of upper and lower dentures; a bow and arrow from Bolivia; nineteen North American flies; and a puzzling donation from Washington State College listed as "one alcoholic squirrel."

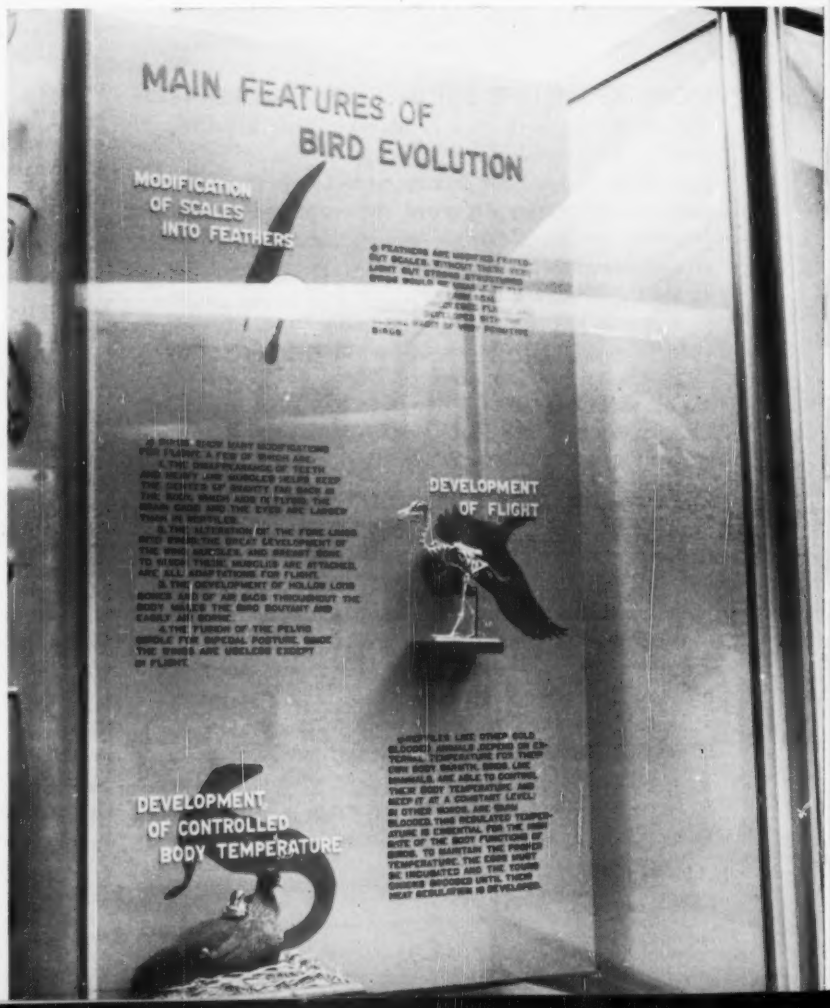
Totaling the score at the end of the 1957 fiscal year, Museum officials declared that there were 44,377,488 items in the national collections, making the Museum, in this respect, the largest in the world. The Museum is, of course, only one division of the Smithsonian, which itself is one of the most important scientific and cultural centers that the world has ever seen.

The Smithsonian was established by the bequest of an English scientist, James Smithson. Smithson died in 1829, leaving a considerable fortune to create an institution, bearing his name, that would "increase and diffuse knowledge among men." It would be located in the United States, a country Smithson had never visited.

Other Smithsonian sections now include the Division of American Ethnology, Astrophysical Observatory, Division of Radiation and Organisms, two world-famous art galleries—the National and Freer—the National Zoological Park, the Air Museum, and the Panama Canal Zone Biological Laboratory. Today, most of the funds for Smithsonian programs come from the federal government, and the Smithsonian is a ward of the United States.

While the other divisions are of great influence throughout the scientific world, the rambling old buildings on the Washington Mall that house the United States National Museum are fixed in the American public mind as "The Smithsonian." The Museum was founded just a century ago, and since 1858 the Museum staff, the United States and foreign governments, independent scientists and the general public have been adding to the collections. This great, irregular snowfall-like accretion of historical, scientific, cultural and assorted curious objects has settled about the Museum buildings with spectacular results.

Most importantly, the Museum has built the finest



Many of the new Museum exhibits, like this panel entitled "Main Features of Bird Evolution," present visual science lessons.

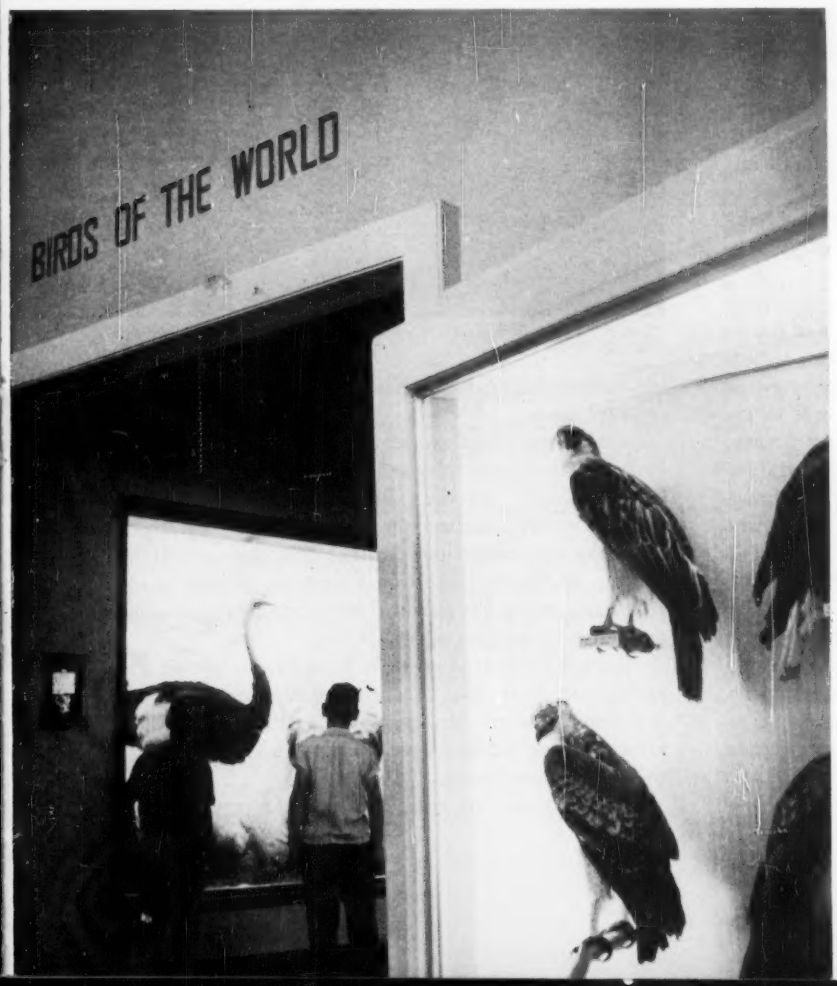
By BIL GILBERT

Photographs by the Author

The "new look" tells its story simply and attractively.

collection in the world of materials that relate to the natural history, anthropology, geology and paleontology, engineering and industries, graphic arts, numismatics, philately, and history of the United States. A second result of this massive collecting was the critical overcrowding of the Museum buildings. The public exhibition halls were bulging with close ranks of specimens and old-fashioned cases. Visitors—and some 5,000,000 a year come to this most popular of all American museums—were simply overwhelmed by the quantity and diversity of the collections. For this reason, the Museum earned its nickname of "The National Attic."

"It was a curious situation," says Dr. Herbert Friedmann, Curator of Birds and now Chairman of the Museum's Exhibits Committee. "Visitors often saw and remembered too little because there was too much to see and remember." By the late nineteen-forties, it had become apparent, even to the most casual observer, that something would have to be done about tidying up the "national attic." In 1953, Congress appropriated funds to commence a general house-cleaning and sprucing up of the United States National Museum. Today, Museum officials are well into a long-term program aimed at making the United States collections among the world's most attractive and informative, as well as the largest of their kind.



The renovation program has been guided by the Exhibits Committee, a group of curators representing many different Musuem divisions. The approach of this Committee in planning the "new look" for the United States Museum is explained by Dr. Friedmann, the Committee chairman. "In general, the Museum serves two groups," he says, "the visiting, lay public, and the scientists, students and collectors who use the material for research or reference." The public comes to browse for general information and as a form of recreation, so it seemed the exhibition areas should be made as attractive and informative as possible. On the other hand, the scientist usually has a specific objective in mind. Exhibition space is in a sense wasted on him. A small drawer of animal skins is usually more convenient for the zoologist than a large case of mounted creatures. "We had," says Dr. Friedmann, "too much displayed material to make good public exhibits, and these exhibits took up far more space than if they were stored, or in study collections."

In view of these circumstances, it was

Each of the new Museum halls are separate, planned units, and each is devoted to telling the story of its subject.

Robert Hogue, a former commercial artist, prepares models for a new exhibit. After nearly five years of working together on new exhibits, Museum scientists and artists have developed a mutual respect for each others' talents.

Below, John C. Widener (at left) and Tom Baker, one of the Museum's exhibits specialists, work on a model of a blue whale. The whale, which will be made of plastic and steel, will be a 90-foot-long exhibit in a new Hall of Oceanic Life.

decided to select the best and most representative material and display it in a series of new exhibition halls, specifically designed to attract and inform the public. The remaining exhibition material would be put in storage or study collection. This plan has resulted in more usable Museum space and more effective public displays, but has not curtailed the Museum's scientific resources or services.

Each of the new halls in the renovated Museum is planned around a single general topic, such as Birds of the World, Mammals of North America, North American Indian Life. Within each hall carefully selected exhibits illustrate the over-all theme. Since realism is one of the most effective and informative display techniques, many of the new exhibits are in the form of life habitat groups, or dioramas, which are three-dimensional scale models shown against a curved background. Dramatically lighted, these scenes are remarkably true to life. One young museum visitor, coming face to face with a habitat group of ostriches, piped out, "Can we wait for them to feed the big birds?"

Several of the halls show scenes of early American Indian life. Realistically sculptured and painted Indian figures are using objects from the Museum's vast archeological collections. A Congressman, after viewing several of these life groups, declared, in tribute to the effective displays, that he was going to put a stop to the barbaric practice of stuffing humans for museum exhibits!

"We want the halls to tell stories," says Dr. Friedmann, in explaining the design of the new exhibition areas. "We try to connect each display with its meaningful environment, historical period, or geographic location, and to relate individual exhibits within a hall to each other so that the whole series makes a narrative."

The Museum staff has found that simplicity is a storytelling virtue. The Hall of North American Mammals, for example, contains only twelve life groups. Yet, for the average visitor, these twelve major species, shown in real-life attitudes and environments, create a clearer impression of the range and variety of mammal life than do hundreds of mounted mammals displayed in crowded cases.

Some of the visual stories told in the new halls describe scientific principles and theories, rather than life-like situations. In the "Birds of the World" hall, colorful alcoves outline the facts of bird migration, evolution and extinction, feeding, courtship and flight habits. Skeletons, dissection specimens, plumes, maps and charts, as well as mounted birds, are used to demonstrate these principles of ornithology.

"In such exhibits," says Dr. Friedmann, "we do not attempt to force any conclusions from the material. We simply present the evidence so that the museum visitor can see the facts upon which scientists base their theories and conclusions."

By the end of this year, eleven of the new "subject

After the curator and the exhibits committee approve the final script for a new hall, the exhibits specialists go to work on specimens. Here taxidermist Frank Greenwell prepares a fox skin for exhibit.

Exhibits specialist Frank Greenwell also makes realistic forest foliage from plastic sheets, adding such subtle imperfections as small, irregular holes and rents to stimulate the work of insects.

halls" will have been completed. In addition to the Natural History sections mentioned above, these include halls of Gems and Minerals, North and Latin American Indian Life, Power Machinery, Military History, Graphic Arts, Everyday Life in Early America, and Old World Archeology. The Mammals of the World display will be opened in 1959, and eventually all the exhibition space in the existing Museum buildings will be arranged according to these topic halls. In addition, ground was broken in the summer of 1958 for a new Museum building that will house the collections of History and Technology. This building, also on the Mall in Washington, will be completed in 1960 or 1961, and will contain seventy subject halls.

It takes about two years to build one of the new halls in the existing Museum buildings. Preliminary plans or "script" are made by the curator whose department is to be remodeled. The curator determines what story his hall will tell, and selects material for exhibits that he believes will dramatically and informatively carry out the theme or narrative. The curator sends the first script of the proposed hall, along with reference readings, to the Museum's exhibits staff. The forty-member exhibits staff, one of the most skillful and versatile artistic groups in the nation, has been recruited from many fields. Men and women trained as commercial artists, industrial designers, fabric creators, taxidermists, model makers, lighting engineers, carpenters and electricians are now designing the dramatic new displays of the National Museum.

After nearly five years of working together on the new exhibits program, Museum scientists and artists have developed a great mutual respect for each others' talent and ingenuity. However, initially there were times when artistic and scientific viewpoints were at odds. A distinguished scientist recalls an artist, fresh from the advertising business, who demanded that the bones of an extinct moa be painted bright red, the better to carry out the decorative scheme he had in mind for a particular exhibit. "Red bones would have been colorful," admits the scientist," but the beast was incredible enough without giving him a crimson skeleton."

The exhibits staff, working from the curator's script, lays out floor plans for each new hall. The number, size and arrangement of the alcoves and cases within a hall are determined. Sketches and scale models are made. An individual design theme is created for each hall. A particularly appropriate theme was created for the Hall of Gems and Minerals.

"Minerals present the widest and freest range of color and form in the natural world," says Rolland Hower, the exhibits specialist primarily responsible for the design of this hall. "We therefore selected a modern, free form motif to complement the collections. In the gem section we tried to create a Tiffany-like atmosphere of elegance. Just as rich settings enhance mounted

Specimens for the halls are cleaned, repaired, and mounted in the Institution's exhibit workshops (photograph above), while, at the right, Tom Nelson, a former stage lighting expert, is planning the modern lighting effects that will be used for the exhibits.

jewels, so elegant rich surroundings best display the Museum's gem collection, which is among the world's most valuable."

The curator and the Exhibits Committee approve the final script of a hall. The exhibits staff then begins the cleaning, repairing, mounting and installing of the displays—work that may involve anything from dry cleaning a dusty okapi to manufacturing insect-chewed leaves.

The desire for absolute accuracy has created problems for the versatile exhibits staff. In the North American Indian Hall, the script called for a seventeen-foot-tall Arapahoe teepee. The buffalo-hide covering was in the Museum collection, but there were no easy, do-it-yourself instructions on how to erect the supporting poles of the big Indian tent. The curator and staff not only wanted a teepee, but they also wanted to put it up just as Arapahoes did a century ago. Sketches, engineering formulae, and trial and error tinkering failed to solve the problem. Eventually the Museum found an elderly Arapahoe squaw who recalled how, in her girlhood, poles had been cut and secured around the elliptical base of the tent. Following the squaw's instructions, the staff drew a plan for the teepee and ordered the custom-made case that would house the exhibit. Eighteen somewhat apprehensive months later, when the case was installed, the exhibits staff found that their original plan for the big, irregularly shaped tent differed only one and one-quarter inches from the dimensions of the completed teepee. An impressed Museum official afterwards remarked, "Our exhibits people are probably the only ones left in the world, including the Arapahoes, who can do a proper job of raising an old-time Arapahoe teepee." The many who see this will not realize it.

In the bird and mammal habitat groups and dioramas, great pains are taken to design realistic painted, perspective backgrounds, relief terrain, and to assemble secondary flora and fauna. White-tailed deer, for example, are shown against the tangled growth of a swampy forest. Sharing this boggy thicket, as they might in real life, are a raccoon, pileated woodpecker, parula and prothonotary warblers, frogs and dragonflies. The small species are themselves of interest, and do much to tell visually a story of swampland ecology.

Most of the items displayed are real ones taken from the Museum collections, but occasionally the exhibits staff has found that a manufactured model will appear more real than an actual specimen. Leaves on trees, for example, lose their color and character when preserved for display. The exhibits staff has manufactured a mold —using the real leaf as a pattern—that will cut exact leaf replicas from plastic sheets. Spray paint gives the artificial leaf a desired color that will remain true almost indefinitely. The foliage of any species can be duplicated in this way. For complete realism, the staff adds such subtle imperfections to their plastic leaves as small, irregular holes and rents, simulating the work of nibbling insects.

The exhibits staff is not always concerned with natural history. A design problem of a different sort was solved in the Gem Hall. A valuable collection of Museum diamonds was to be displayed in a single large case. To safeguard the precious stones, the exhibits staff designed an attractive display case, ingeniously set into the workings of an ultramodern, sonically guarded safe Another factor, not generally (*Continued on page 550*)

Who Grew Your Christmas Tree?

By JOHN D. KENDIG

Photographs by the Author

These young Scotch pine trees on a 50-acre Christmas tree farm near Reading, Pennsylvania, are nearly ready for cutting and shipping.

WHO CUT the first Christmas tree in America? The answer to this question is obscure, but it is certain that the first tree came from natural forest, swamp or early cleared lands. And as Christmas trees increased in popularity, certain enterprising individuals saw business opportunity in cutting and selling them. This, in turn, often led to the wholesale and frequently destructive cutting of many young evergreens, and even to the stealing of trees from private property. To make matters worse, there were sometimes great numbers of young trees left unsold after Christmas.

Such abuses finally resulted in a public reaction against the destructive and wasteful handling of trees, even to an attempted banning of the whole Christmas tree idea. It is said that President Theodore Roosevelt would not allow a Christmas tree in the White House, but that his sons managed to sneak one in and put it up in their quarters. When Roosevelt found it, he was furious, and it is hard to tell what might have happened to the boys if Chief Forester Gifford Pinchot had not come to their rescue. He explained to the President how Christmas trees could be cut conservatively, by thinning, so that their removal would actually benefit the remaining trees. Later, another president and another Roosevelt—F.D.R.—became one of the country's earliest Christmas tree farmers at his Hyde Park estate in New York.

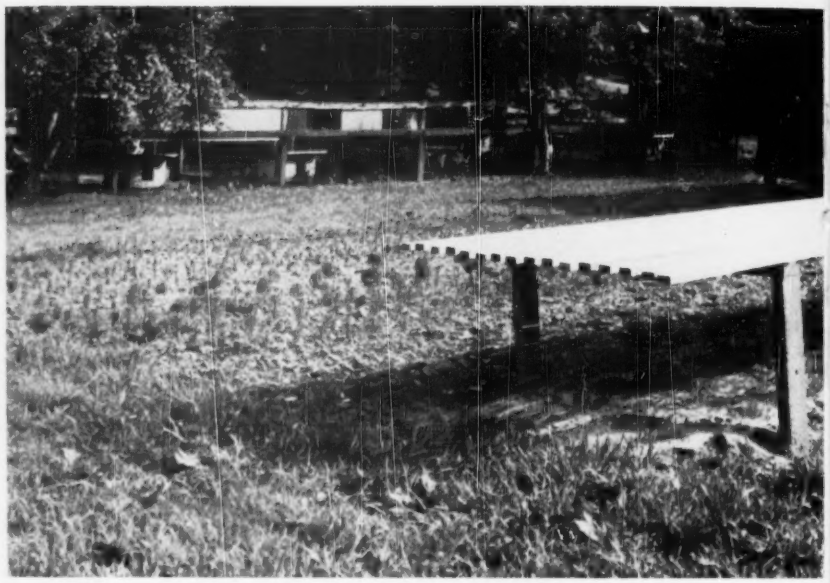
The young man in the illustration below is shearing a small white pine that could be sold this year as a table or picture window tree.

Meanwhile, men like Roy Halvorson of Duluth, Minnesota, went into the business in a big way, cutting trees from swamp and wild lands. From his own property and thousands of acres he contracted from the government, Halvorson cut and shipped a million trees a year all over the country, many of which were marketed through chain stores. Cuttings were directed by forest rangers, and were so conservative that only five percent of the stands of spruce were removed. Part of the returns from such tree sales went back into the Minnesota State School Fund.

It was probably about the year 1918 that someone developed the idea of planting and raising evergreens especially for Christmas trees. The idea first seemed to develop in Indiana County, Pennsylvania, an area now known as one of the largest producers of planted Christmas trees in the country. Here there are many great evergreen nurseries that have plantations of their own, shipping small trees for both Christmas and for forest tree planting to many of the countries of the world.

No great strides were made in the new industry of Christmas tree farming until about 1926, and the biggest developments date from 1930. The industry is steadily growing more important and businesslike all the time, and has now attained multi-million-dollar proportions.

Pennsylvania is the largest producer of planted Christmas trees in the nation, and was the first to organize a State Christmas Tree Growers' Association, in 1942, to help the local growers with their production and marketing problems. This organization has a membership of 500, the most of any of the fifteen associations in the country, including those of California, Illinois, Indiana, Maine, Maryland, Michigan, New Hampshire, New Jersey, New York, the Northwest (Oregon and Washington), Ohio, West Virginia and Wisconsin. Canada has one such association in New Brunswick.



Some Christmas tree farmers raise their own planting stock. New seedlings, germinated this season, are under the lathe frame at the right, while to the left and center are three-year-old seedlings ready for transfer to the Christmas tree plantation in the spring.

In Pennsylvania, nine counties have formed subsidiary growers' organizations, with special summer field meetings. For two years a Christmas tree exhibit has been held in January at the annual Farm Show in Harrisburg, where a prize contest is held to pick the most perfectly grown Christmas tree. Other States with competitive exhibits are New York, Maryland, West Virginia, Ohio, Indiana and Wisconsin. Often local county agents schedule special field meets and demonstrations at which pruning, grading and marketing of the trees is considered, as well as protection from insect and disease damage.

More than forty-four special bulletins on the work of the Christmas tree industry have been issued by various State and national agricultural agencies and colleges throughout the nation, and two books recently have been published on Christmas tree farming.

A National Christmas Tree Growers' Association was organized in 1955. It cooperates with the State associations in setting up tree-grading standards. It works for the establishment of Christmas tree growing as being eligible for capital gains classification for tax purposes, rather than being treated as straight income. Further work is also done on research, publicity and nomenclature. Usually both national and State organizations mail helpful bulletins to members at intervals, helping them to keep up with new developments and price trends in the industry. Surveys also are made to find out the numbers and types of trees the members will have available for sale, and where they may be sold.

One of the important new developments in the industry is the grading of plantation

A plantation of Scotch, white, and Austrian pine in Lancaster County, Pennsylvania, near Manheim. These future Christmas trees are checking erosion and providing shelter for birds and small mammals.

The photograph above shows a young white pine plantation in which the heavy weeds have been mowed so that the trees may develop good crowns and reach marketable size as soon as possible.

At right, a specially grown, sheared Scotch pine is in contrast to the unsheared tree of the same age.

trees like lumber or apples. Such characteristics as density, taper, balance, foliage and deformities will be considered, points that are thoroughly explained in a United States Department of Agriculture publication of November, 1957, *United States Standards for Christmas Trees*.

Newspaper and magazine publicity has pictured Christmas tree farming as a rather pleasant, easy way to make money from marginal land, and has encouraged some people to try their hands at it. They soon learn, however, that there is more to Christmas tree farming than planting the trees one year and cutting them eight years later at a nice profit. In between, the trees must be kept free of heavy weeds and brush. They must be pruned regularly, and they must be protected from fire, grazing, insects, diseases, rodents and people. A season of drought may kill new plantings, and late, heavy snows—like those of the past spring—can damage nearly all sizes of trees quite severely. Christmas tree farming is a serious business, best done by people who live on the soil, know something about trees, and enjoy working with them. It is certainly a good use for poor, idle or hard-to-farm land. It can be a fascinating business, sideline, or hobby that may pay well for those who are willing to work.

During the past few years there has been a great increase in the number of Christmas tree plantations scattered over the country, and farmers and land owners have been putting many acres of their land into Christmas tree production. Some even raise their own little trees from seeds, keeping them in nursery beds a few years before setting them out in plantations. Many such tree growers retail their own trees in direct sales from the land, by means of town delivery routes and from town stands. Large growers have hundreds of acres in Christmas trees, and wholesale thousands each Christmas season, besides retailing hundreds.

In Ohio, only a few years ago, virtually no home grown trees were in evidence. Now, according to the 1957 report of the Central States Forest Experiment Station, about twelve percent of the one and one-half million Christmas trees marketed there yearly are raised in plantations, and growers are now planting at the rate of more than three million trees annually.

In New York State it was estimated that, in 1957, 526,000 trees were grown and sold locally and there will be about 1,200,000 ready for market in 1958.

Pennsylvania has had similar increases. In 1956, 700,000 locally grown trees were sold in the State, and 275,000 were shipped out-of-State. In 1957, a total of 1,100,000 trees were marketed. According to the Forest Products Marketing information report of the Pennsylvania State University, there have been more than 65,000,000 Christmas trees planted in that State, of which 15,000,000 were set out in Indiana County. Scotch pine has been the leading species used. Other species include Norway spruce, red pine, white pine, Austrian pine, Douglas fir, white and blue spruce.

Annual plantings in Michigan have increased up to four hundred percent in the last years, and the annual output is more than a million trees. It readily may be seen from the 1957 season summary on the Christmas tree industry in Pennsylvania that there is already an indication that locally grown plantation trees will replace many shipped-in trees cut from natural stands.

It has been reported that the quality of Christmas trees shipped from parts of the United States and Canada is likely to become poorer, as foresters who have been watching the stands from which they come say that quality trees are getting more difficult to find all the time. Even if shippers attempt to improve the quality of such naturally grown trees, it is doubtful if they will be able to compete with specially grown plantation

trees that receive intensive shearing, care and grading.

Men like Alvi O. Voight, of the Agricultural Economics Extension Section of the College of Agriculture at Pennsylvania State University, and Robert R. Paton, Secretary of the National Christmas Tree Growers' Association, say that according to recent market surveys plantation grown Christmas trees will displace a large percentage of the shipped-in, forest-grown trees. Natural trees will not be wholly displaced, however, as balsam with its soft needles, sweet aroma and storied tradition has long been a favorite, and it is difficult to raise successfully in many parts of the East. Douglas fir, another desirable tree, is also more difficult to raise than the plantation grown pines, and it takes longer. Therefore it should have a chance to survive as a shipped-in tree.

Mr. Paton also says that plantation trees may even glut the market by 1960, but certainly many of the trees now being planted will never be harvested as Christmas trees, and those not needed for this purpose can be left to grow into saw timber or other wood products, or to help beautify the landscape, conserve soil and water, and provide homes for various kinds of wildlife.

It seems fairly certain that the locally grown plantation tree will be the "big selling tree" from now on in the Christmas market. It can be raised close to the markets of such cities as New York and Philadelphia, and cutting can be more closely adjusted to the demand. Hence fewer trees will be wasted, and left unsold on Christmas Eve. Such trees can be fresh-cut, lessening the fire hazard in the home, and decreasing the nuisance of rapidly falling needles—a characteristic that so often gives the shipped tree a bad name. Certainly a tree cut a day or a week before you get it will have the fresh, attractive look lacking in the bundled, shipped tree.

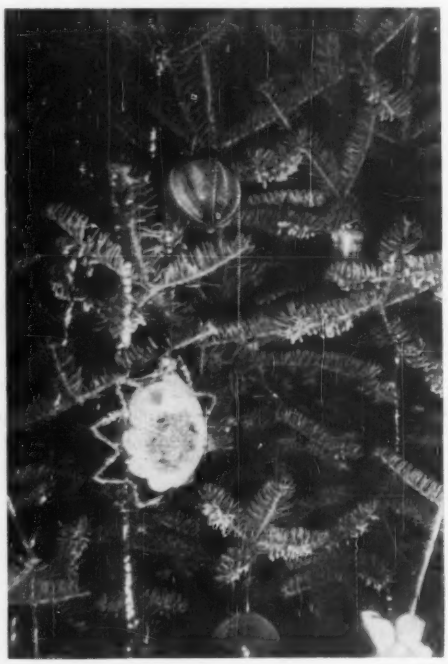
Then, too, by intensive care, pruning, and insect and disease protection a homegrown tree may be made denser, more shapely, and more beautiful. There is a matter of pride, too. The man who has grown the tree often may see it later in the home of a friend or neighbor. Christmas tree farming is a personal thing in many cases, and the responsibility for a good product may be local.

It is a far cry from the time when Christmas trees were cut with little system, or with little consideration save that of immediate gain, to the present. Nowdays, the trees are especially grown on poor or idle land, and on steep, bare hillsides often fit for little else. They help provide a continuous land cover and check erosion, holding the soil in place and conserving water, at the same time furnishing shelter and homes for wildlife. They add beauty and interest to the landscape. Plantation-grown Christmas trees are here to stay!

Christmas Dust

By ISABEL A. GEHR

Photograph by the Author



"Along the undersides of most of the branches were little catkin-like flowers drifting yellow pollen. . ."

"SURELY the house can't be this dirty," I thought, as I looked at the floor under the Christmas tree. Guests were coming. If the rest of the house were as dusty, I would never be ready! Even the ornaments were covered. That thought halted my dash for the mop. Something strange was going on.

I took a closer look. The dust was yellow—an odd shade for Philadelphia—and it lay not only on the floor but on ornaments, lights, and branches from the top star to the lowest twig of the lovely balsam fir, calling to mind the dust-covered pinon and juniper of the Southwest before the rains come. Three feet away the polished top of the maple book case reflected the colored lights. There was no dust!

Our Christmas tree was blooming. Along the undersides of most of the branches were little catkin-like flowers, drifting yellow pollen over the ornaments and needles below. Probably the warmth of our house meant spring to our northern tree.

Gathering pollen, we shook it over the upper branches, wishing that purple cones might ripen, marvelling at the call to live and reproduce, conscience-stricken at our interruption of the process, the irony of death to celebrate life. Our Christmas beauty took on new significance.

After the holidays our valiant tree stood in the wind and snow in a corner of the yard, a shelter for sparrows, jays, and an occasional pigeon. Suet and cranberries decked it until the needles turned brown. On a closet shelf are the ornaments, carefully packed to protect the pollen to remind us, this Christmas, that life goes on and on.

The Preposterous Coot

By ANN and MYRON SUTTON

In silhouette, coots are unmistakable. A particular characteristic is that of bobbing the head forward and backward as the bird paddles through the water, much as a chicken moves its head when it walks.

PHOTOGRAPH BY L. G. KESTELOO

OF NATURE'S extraordinary clowns on two wings, perhaps the loudest, oddest, and most laughable is the American coot. Wherever enough water collects for a reasonably calm pond, this roguish black rail and its brethren may assemble like conclaves of convention-goers. Few American birds are as common as *Fulica americana* and so little known.

Yet wherever they gather, that place becomes the happiest spot in the neighborhood. Although the coot will never be adored for its beauty—or its atrocious manners—it is nonetheless a disarming and lovable character. Whatever it lacks in looks, it makes up in fun.

For all its rakish appearance, this amiable water bird epitomizes the curious struggle that wild fowl have had against man, and which man has had—and is still having—patching up the havoc wrought by indiscriminate gunning and marsh-draining.

Since the turn of the century, wildlife research has piled up methodical management know-how about the care and keeping of persecuted bird tribes. The coot is no exception. Once nearly extinct, it has been brought from a wilderness "menace" to a status of dignity.

Fifty years ago "coot" was a duck-hunter's epithet. The bird was cursed, hunted, eradicated, and consigned to extermination. Then science proved that coots are innoxious to man and duck alike, that they rarely damage crops or gardens, that they are not overpopulated enough to foul up propellers, snag fishing lines, or crowd out the "ole swimmin' hole."

In short, the coot is here to stay, and everybody from hunter to bird watcher seems delighted. In fact, as Herbert K. Job has said, "If there is a more amusing bird anywhere, I should like to see it!"

In recommending the coot as an "antidote for the blues," Job was not amiss; it is still touted as one of, if not *the* funniest bird on fresh water, and it looks the part. Although garbed almost entirely in solid black, it is one of the few birds in the world with a gleaming all-white bill. Furthermore, its eyes are glittering scarlet.

PHOTOGRAPH BY C. J. HENRY

Because they produce as many as sixteen young to a family, coots perpetuate themselves remarkably well. The eggs are laid over a period of several days, and the young hatch one at a time, promptly swimming off under the care of the male bird.

PHOTOGRAPH BY E. P. HADDON

The loud, squawking, pattering take-off across water is a definite trade-mark of the American coot. It seems reluctant to fly, and on short flights of a hundred yards or so it may never rise from the water at all.

The coot is at home around water, but is by no means a duck. It is strictly a rail—the most aquatic member of the rail family. In other circles, it gets by variously as a mud hen, blue-pete, moor-head, pond crow, and at least twenty-five other local designations.

Wherever it dwells—from Alaska to Ecuador—the inland pond or lake is home. There is, of course, no reason why it can not visit mountain lakes for a diverting sojourn, and it does, if for no more reason than to escape the heat and humdrum of lowland swamps and marshes.

Civilization makes no difference. At Roaches Run Waterfowl Sanctuary near Washington, D. C., thousands of cars drive daily along the four-lane Mount Vernon Memorial Parkway scarcely thirty feet from the water's edge, and commercial airliners all but scrape the trees fifty feet overhead as they take off with a roar from National Airport, but the nonchalant coot takes it all in stride.

And yet the coot is a wild bird, with wild ways. It has one of the most diversified voice repertories in the animal kingdom, screeching out everything from a "high C" honk to a low-toned croak. It has to, for among coots life is one interminable search for the next snack, or for a mate.

Coots take up definite territory at mating time, more so than many other birds, and defend it loudly and raucously against all aggressors. To let the world know exactly how it feels, the coot has fourteen separate displays, including charging, courting, and patrolling. But the most familiar trademark of this avian aquaplane is its takeoff. Instead of rising and flying like other pondside birds, the coot lifts its wings and patters across the surface with a pandemonium of quacks and splashes.

Sometimes it may wish it could rise abruptly from the water like a helicopter and shoot off to safety in a hurry, an ability reserved for a select few ducks like the mergansers. But the staid and matter-of-fact coot seldom considers immediate and permanent escape, and is not as wary or quick to upset as other waterfowl. Usually, to get out of harm's way, it merely patters to the other side of the pond. Thus it has become, in its own harmless world, one of the tamest, most easily approached birds of the wild waters.

You can sneak in surprisingly close for a ringside seat to a pondful of coots—which is something akin to a three-ring circus. These hyperactive black-feathered clowns scramble frequently and noisily across the water, pursuing or being pursued by their colleagues. Sometimes they are chased headlong by zealous adversaries. Sometimes the eternal love triangle flames into combat.

Sometimes the neighbors get into the act. Coots often live in cattail- and pondweed-filled waters inhabited by muskrats. Apparently the muskrat has nothing but contempt and disdain for his pondmates, whom he may consider intruders on private property. It is up to the coot, accordingly, to keep out of the way; and apparently nothing startles a nonchalant coot more than being ambushed from beneath by a muskrat, or having a leg nibbled by mistake. The coot erupts straight out of the water and skitters off to the far side of the pond.

In the long run, despite what friendly or obnoxious tricks muskrats play, the coot does not seem to care at all, and may even thrive on the company. While coots live singly on a pond for weeks—and obviously enjoy the solitude—they also congregate in flocks, either with other coots, or with ducks, or both. On Florida's Lake Okeechobee alone the wintering coot population has been estimated at more than 20,000. A winter census of a lake in Arizona may include a thousand coots, a thousand gadwalls, a thousand baldpates, and assorted other species like pintails, mallards, canvasbacks and ruddy ducks in lesser numbers.

To keep this diverse arrangement more or less consistent, the lake must have one thing in abundance: food. The surface may freeze over on cold nights (mortally trapping a few hard-sleeping baldpates and gadwalls), and it may not be the cleanest or wildest lake in the world; but in it, on it, or around it there must be something to eat.

This something, as far as coots are concerned, need only be pondweed or algae. Coots eat almost anything they can lay their white beaks into, and top it off with such delicacies as water milfoil, bur reed, and wild celery. Sometimes they eat grain put out to attract ducks, and in so doing have brought down the wrath of hunters; in times past, "coot shoots" have wiped out as many as 5000 coots in a single day.

Actually, coots do not always compete for foodstuffs with ducks and other water birds, which feed mostly on crustaceans, water insects, and aquatic roots and stems. For the most part, it is a harmonious arrangement, and their amiable personalities allow (*Continued on page 550*)

This is a "bug's-eye" view of a bird spider. The eight eyes are located in a "turret" just in front of the light, arrow-shaped marking on top of the cephalothorax, and are centrally located and raised to give the wide field of vision so necessary to a predator.

Giants of the Spider World

By JOHN M. MEHRTENS

Photographs by the Author

One fall day about two years ago, I rather sleepily answered my telephone, and was informed that "another one is available if you want it." A quick trip to the local wholesale produce market followed, and I was soon in possession of another bird spider, a stowaway in the uncut stalks of newly imported bananas.

As might well be expected, such specimens are in rather poor condition after their long journey. In fact, it is usually only those spiders that happen to be in a tight air-pocket between the stalk and the "hands" of fruit that manage to survive the disinfectant "dunkings" and fumigant gassings that the fruit receives. Those that do come through usually revive after careful treatment—which includes plenty of water—and live to become interesting residents of our study collections of live animals. The bird spider I received as a result of this incident is the same specimen shown in some of the illustrations for this article.

The Theraphosidae, or tarantulas—the group to which the bird spiders belong—are usually thought of with our own southwestern tarantulas in mind. Although there are quite a few species of these indigenous spiders, they do not approach the diversity of form, color, size and habits of their tropical cousins.

These large arachnids have several popular names. In Central America, they are called *matacaballos*, or "horse-killers." In Brazil, they are called simply *aranas peludas*, or "hairy spiders;" but perhaps the most suitable is the English *bird spider*. This name has been derived from the habit of many arboreal species of preying on small birds, usually nestlings—a fact first noted by the European naturalist, Marie-Sybille de Merian, who, during a trip to Surinam in 1703, observed these spiders feeding upon small birds. Her observations were met with great skepticism, but have since been confirmed by many other competent observers, and are now accepted as true. The large specimen that appears in some of these photographs refuses to feed

Although posed beside a six-inch rule, this photograph does not give a wholly accurate impression of the spider's size. Fully extended, this specimen could cover an average-sized luncheon plate.

This particularly attractive species of arboreal bird spider is dark brownish-black in color, clothed in bright reddish-yellow hairs. The undersides of the feet are colored light blue.

spiders, however—like some of the arboreal species I have had—seldom employ this technique, and defend themselves by rearing up and exposing their formidable fangs.

On the subject of fangs, perhaps a few words should be said about the poisonous nature of spiders. All spiders are venomous, but most of the creatures are so tiny that the venom presents a threat only to the small insects used as food. Even our large native tarantulas cannot be considered truly dangerous to large mammals, including man. The tropical bird-eaters, on the other hand, are usually much larger in size, and have correspondingly greater fang length. This, coupled with their larger supply of venom, might conceivably enable a large bird spider to inflict a serious or even fatal bite on larger animals. Remember, however, that, as with all venomous animals, the venom is designed as a means of subduing prey. In spiders it also serves as a predigestant, and the use of venom as a means of defense is only secondary.

The spiders that arrive in this country in banana bunches are not necessarily arboreal. For instance, the fruit may be laid on the ground in its native land, enabling a terrestrial species to

on such things as large insects, but will readily accept freshly-killed mice, chicks, and sparrows. Oddly enough, these will only be taken dead, for anything moving in the cage with this spider will immediately provoke it into sending off a barrage of hairs from the abdomen, after which it quickly scuttles into the security of its hiding place.

This barrage of hair is an interesting phenomenon. In addition to the long guard hairs, the abdomens of bird spiders are covered with fine short hairs. This abdominal hair has an irritating quality, especially when brought into contact with the mucous membranes of the oral and nasal passages and the eyes. The spider, when annoyed, elevates its abdomen, and with its hind legs rubs off a quantity of hair and rapidly brushes it in the direction of the intruder. The use of this hair as a defense against small predators is obvious. Other bird

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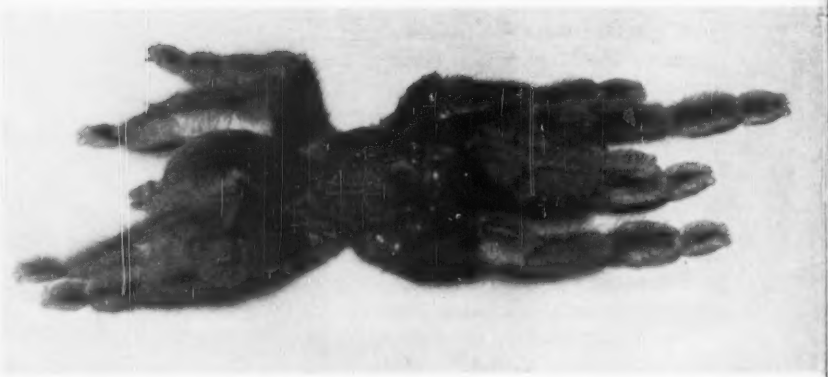
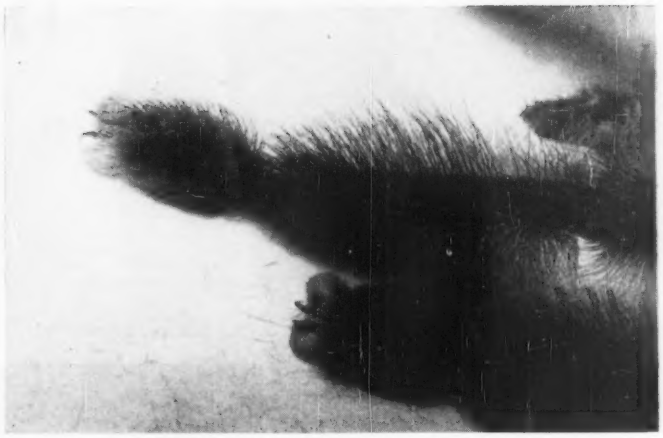
Fangs rivalling those of a small rattlesnake are possessed by some of the bird spiders. Little is known about the venom of these tropical giants but it is obvious that some, at least, are capable of inflicting serious injury on the larger mammals.



The arboreal species of bird spiders generally have a more compressed body, and habitually rest with the legs stretched out in a line with the body. The tiny claws that assist the animal in climbing are visible in this photograph.

A detailed photograph of the legs of one of the arboreal species of bird spider shows the two sharp, curved claws that, with the thick pad of hair beneath them, enable the spider to climb over nearly any surface.



gain shelter. After I secure a new specimen, I must determine a suitable cage environment, for many spiders will sullenly refuse food unless conditions are to their liking.

I have found that several distinct habitat preferences exist. The terrestrial, or ground-dwelling forms, simply require ample space to scuttle about in addition to a dark hiding place like a curved bit of tree bark. Others, which are called semi-arboreal, use a hollow stick or bark tube to advantage. They hide within the hollow when resting, and use the outside as a vantage point from which to watch and wait for food. Still others are completely arboreal, like the specimen illustrated.

Some use silk more freely than others. One lines the tube of bark in its cage with silk, the edges of which are connected to a loosely spun net on the outside. The contact of any small creature with this exterior web informs the lurking spider of the presence of prey, and that dinner may soon be served. All these spiders require a high humidity.

Of all the fascinating actions performed daily by the inhabitants of our small collection of these furry arthropods, perhaps the most remarkable is the periodical ecdysis, or skin-shedding. There seems to be no definite time interval between such sheddings, but the spiders usually give notice of the procedure by refusing to feed for some weeks before the actual shed. They also begin spinning a fairly thick sheet of strong silk on the cage floor. When shedding begins, the entire sequence of events that follows is carried out on this previously prepared web.

The shed starts with the splitting of the cephalothorax along one side, which by contractions is removed from the new skin beneath and laid aside. Slowly the legs of each side are withdrawn from the old skin, as are the chelicerae and pedipalps. Finally, after a series of convulsive contractions, the abdomen is freed and the completely cast skin is pushed aside. The spider now lies quietly waiting for the new coat to harden. I have observed this process to be completed in as few as three hours, but it sometimes takes as long as twelve. When freshly shed, the velvet-like coat and bright colors of the spider may be seen at their best.

While I consider myself fortunate in having been able to secure much data and good color photographs of my spider guests, I have only once been able to secure one of the rare males. This was the Argentinian species, *Grammostola gossei*, and was sent to me, with several females, by a good friend in that country. Unfortunately the male did not survive the trip, and arrived dead. I am looking forward to "next time," though, for the study and photography of the courtship and breeding of these remarkable creatures holds forth the promise of many exciting discoveries.

MOONLIT CHRISTMAS EVE

How strange this old familiar landscape seems. . .
Like Somewhere seen in half-forgotten dreams. . .
The light upon it from the rising moon's
Enchanted: see the sculptured snowdrifts now
Are changed into Arabia's golden dunes.

There's muted music on the far-off wind,
Thrilling, although the words are undefined—
Secret and thinned. . .
The Star is burning in the Eastern sky:
Be still. . .and wait in silence—we may see
The Wise Men going by.

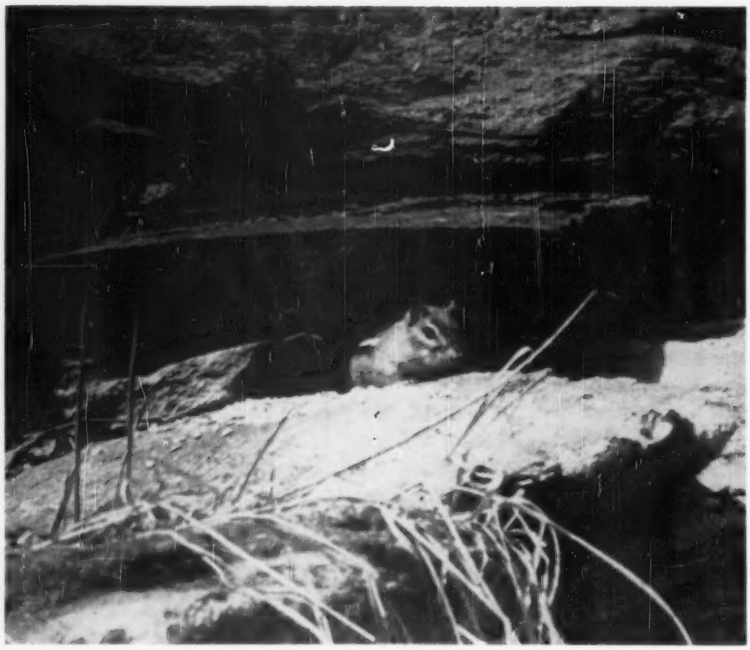
Marion Doyle

Underneath the stone-faced terrace was the burrow of Chuck-chuck the chipmunk, whom the author came to know better during a period of enforced idleness.

Dooryard Sprite

By HOPE SATTERTHWAITE JEX

Photographs by the Author



Chuck-chuck, whose gender was determined by subsequent events, soon learned her name, and a friendly footing was quickly established by liberal donations of scratch feed.

I WAS disgusted. The twist I gave my foot in slipping on a tussock in the rugged lower field had resulted in a continuing injury. June was just drawing to a close. Our fields and woods and river offered me their summer's wealth. I had planned long, fruitful hours of wandering, watching, listening, learning. And here I was, a hobbledehoy tied to our immediate grounds.

Presently, however, I discovered compensations. Enforced confinement to a circumscribed area provides an opportunity to study it with a concentration that, given wider horizons, you would not, in all likelihood, bestow on it. The garden with its gay succession of blooms; the sweep of lawn, broken by trees and shrubbery; the pool and little waterfall and brook—this, perforce, must be my world. And, as week slid into ensuing week, I came to know it with an intimacy that a summer spent footloose amidst the open countryside would never have permitted.

The stone wall flanking the grassy terrace that edged the eastern side of our house became a favorite resting place. Here, in the shade of a silver maple, I could look across the garden or follow the shifting spray pattern of the miniature cascade below the waterfall, or watch the dark pool, its mirror surface shattered now and then as a fish leaped for a fly. And here I could catch glimpses of the day-to-day activities that spelled living for the creatures, furred and feathered, who made our grounds the hub of their existence.

Eager interest in the small world around me gradually replaced the grumbling resignation that marked the start of my session of enforced idleness. And this change of attitude was greatly hastened by a small, furry neighbor whom in the past I had all too often slighted—the chipmunk who called our terrace home. Most people feel kindly toward this "pint-sized" embodiment of sprightly vigor. But, just because the chipmunk is such a familiar figure in the rural landscape, the little fellow is apt to be taken for granted with a smile of tolerant affection. That summer I came to know our chipmunk and to appreciate the fact that she (gender determined by subsequent events) was not just a decorative microcosm of energy, but an individual meeting life's problems and snatching its joys with a resource that would do credit to a giant.

I called her Chuck-chuck. And she quickly learned her name, this friendly footing being speedily established by liberal donations of scratch feed. In the scientific world she bore the title *Tamias striatus lysteri*, as she was a northeastern chipmunk, a member of the smallest

and palest race of the eastern chipmunks, all of whom belong to the species *Tamias striatus*, as distinct from the *Eutamias* group of western chipmunks. Her two light dorsal stripes were broad and as snowy as her belly. In contrast, the five dark stripes shone like jet. Her facial stripes were palest buff, her sides a yellowish buff. Her warm clay crown, her gray back, her grizzled tail were offset by a golden rump. And, of course, she had cheek pouches which, when well crammed with provender, made her look as if she had the mumps.

A well-used entrance to her burrow lay concealed in the grass of the terrace. This doorway to her home was unobtrusive, marked by no tell-tale mound of earth such as the woodchuck leaves. The narrow burrow plunged downwards steeply for a few inches, then levelled off. I knew that its winding reaches covered considerable territory, perhaps as much as thirty feet, and that somewhere within it Chuck-chuck bedded down in a comfortable nest of leaves. The grass-hidden entrance was not her only doorway. The burrow system also gave upon the rocks of the stone wall. With a flick of the tail she could whisk down the hole amidst the grasses, and a moment later thrust an inquiring face through a crevice in the rocks.

With a flick of her tail, Chuck-chuck could whisk down the hole amid the grasses, and a moment later thrust an inquiring face through a crevice in the rocks that faced the terrace.

There has been much speculation as to how such a complicated network of passageways could be built without outward evidence of the earth that must be removed. Some believe the earth is packed as the burrow is dug; others that the earth is carried out and scattered. In his essay, *Under the Apple Trees*, John Burroughs described a chipmunk's excavation work that he was fortunate enough to witness. In the case of Mr. Burroughs's chipmunk, a work hole, much larger than the finished entrance, was dug from the surface and the earth from the burrow system pushed through this hole and scattered. Finally, a true entrance, dug from within, appeared a little distance from the work hole, which was sealed and obliterated, the entire process taking almost three weeks and the work being done in full daylight, the chipmunk being of diurnal habits.

Our chipmunk's tireless activity was, of course, chiefly directed to the garnering of food. If you had to search through the grasses for seeds to fill your belly and, in addition, had to lay away a store to tide you through the winter months, you hardly could afford the luxury of idleness. When I first made the chipmunk's acquaintance, the seeds of the silver maple seemed to be her mainstay. Thus early in the season most of the seeds she nibbled where she found them, scrubbing her face after every mouthful. But occasionally she would carry choice morsels to her underground larder. Such trips usually involved a whole pouchful of provender, but once in a while she would take a single seed below ground. I timed one of her trips with a single seed. It was an even two minutes before she poked her little head through the burrow entrance. I wondered what rearranging had been going on during those two minutes in the storage chamber. Her storage facilities undoubtedly provided ample closet space, for more than a bushel of hazlenuts have been unearthed from the home of a single chipmunk.

Chuck-chuck's nervous energy, her mingled curiosity and shyness, enlivened the long weeks of that slow summer. As July passed the halfway mark, however, there were intervals of several days when my little friend deserted me. And on the last day of the month I discovered the burrow entrance plugged with earth. To see what would happen, I reopened it. Next day the earth had been carefully replaced, and about two feet from this hole a new entrance had appeared. Under the spirea hedge across the driveway I found another entrance to a chipmunk's burrow with a plugged-up hole about a yard away. Recurrently throughout the summer these entrances were closed and opened.

Aestivation is a common practice among desert rodents. Hibernation in reverse, it seems to have arisen from a shortage of food supply during the torrid weeks when vegetation withers. Some believe that hot-weather torpor accounts for those intervals in the summer when eastern chipmunks stay below ground. Others hold reproductive duties to be the cause. Certainly there is no dearth of vegetation. But baking heat above ground and a well-stocked larder in the cool recesses of the earth might be inducement to drowse away the summer's fiercest days. All that summer Chuck-chuck was most active in the morning, the late afternoon and the long twilight, seeming to shun the blazing midday hours, as did the rest of us. As summer waned, family cares kept her close to home, but her earlier retreats from the world outside seemed to predate even the gestation period. And, as for the male chipmunk—who does not share the burdens of family life—any retirement below ground on his part could hardly be attributed to reproductive responsibilities.

Maple seeds and scratch feed were by no means the sole items on Chuck-chuck's menu. Nor was she ex-

clusively vegetarian in her tastes. Several times I surprised her clinging to the trunk of a young elm on the terrace in obvious enjoyment of the suet-peanut butter mixture that I had smeared on the bark for the pleasure of our woodpeckers. When the cherries ripened, her delight was no less than that of the robins, and she would venture to dizzy heights to pick the ripest fruit. I never saw her pursue any living creature. In fact, one autumn day when I had scattered some bread crumbs on the driveway for the sparrows I found her amicably sharing the feast with them. Yet chipmunks are known to catch and eat salamanders, frogs, meadow voles and small snakes and birds, as well as insects. On occasion, the chipmunk has been discovered rolling grouse eggs from the nest; not eating them, but playing with them and hiding them. Presumably for this reason, the little mammal receives no protection in the Commonwealth of Massachusetts, where so-called conservation is directed mainly from the hunter's standpoint.

In mid-August of that summer, the Berkshire Hills fell within the fringes of two hurricanes that swept up from the south within a few days of each other. The first, Hurricane Connie, brought torrents and high northeast winds from the night of August 11 to the afternoon of August 14. Surprisingly, in the early morning of August 12 a cottontail appeared in the garden, hopping unconcernedly amidst the gale and downpour, while that afternoon Chuck-chuck, with equal unconcern, searched the driveway systematically for provender. Connie, however, was not a patch on Hurricane Diane, who followed after three days of sultry sunshine. The drought-parched earth had soaked up Connie's deluge. When for a night, a day and a second night Diane let loose her fury the ground was already waterlogged. On the morning of August 19 we looked out on brilliant sunshine—and desolation. The driveway had vanished. There was no garden or lawn or pool or waterfall or brook. Instead, a swirling, yellow ocean lay over the grounds and moved in a broad stream across the field to join the swollen river. Compared to neighboring communities to the south and east, we were lucky; but even so it seemed difficult to count our blessings. I never saw the cottontail again. Chuck-chuck, however, had been fortunate in her choice of home. Her terrace stood well above water level.

The next few days were taken up with repair of Diane's ravages. But on August 23 I noticed that both of Chuck-chuck's entrances were closed. My injured foot had healed by now, so that I was no longer restricted to our grounds. Yet I caught glimpses of Chuck-chuck actively abroad on September 8 and eleventh. It was September 17, however, when she treated me to her big surprise. I discovered two baby chipmunks, smaller and darker than my little friend, sitting on the terrace, side by side. Presently Chuck-chuck joined them, and they wandered amongst the grasses. Every so often both mother and babies would run up to each other and touch noses, apparently for reassurance. After a bit, all three retired below ground. The next day I saw Chuck-chuck come out of one of her entrances, then turn and quickly cover it with earth before going on her outing. Yet, a moment later, one of the babies emerged from a crevice between the stones and sat in the sunshine.

In the northeast, chipmunks usually bear their young in late spring or early summer. Litters born later are thought to be those of the previous year's young that failed to mate in the spring. Thus Chuck-chuck herself may have reached maturity only recently.

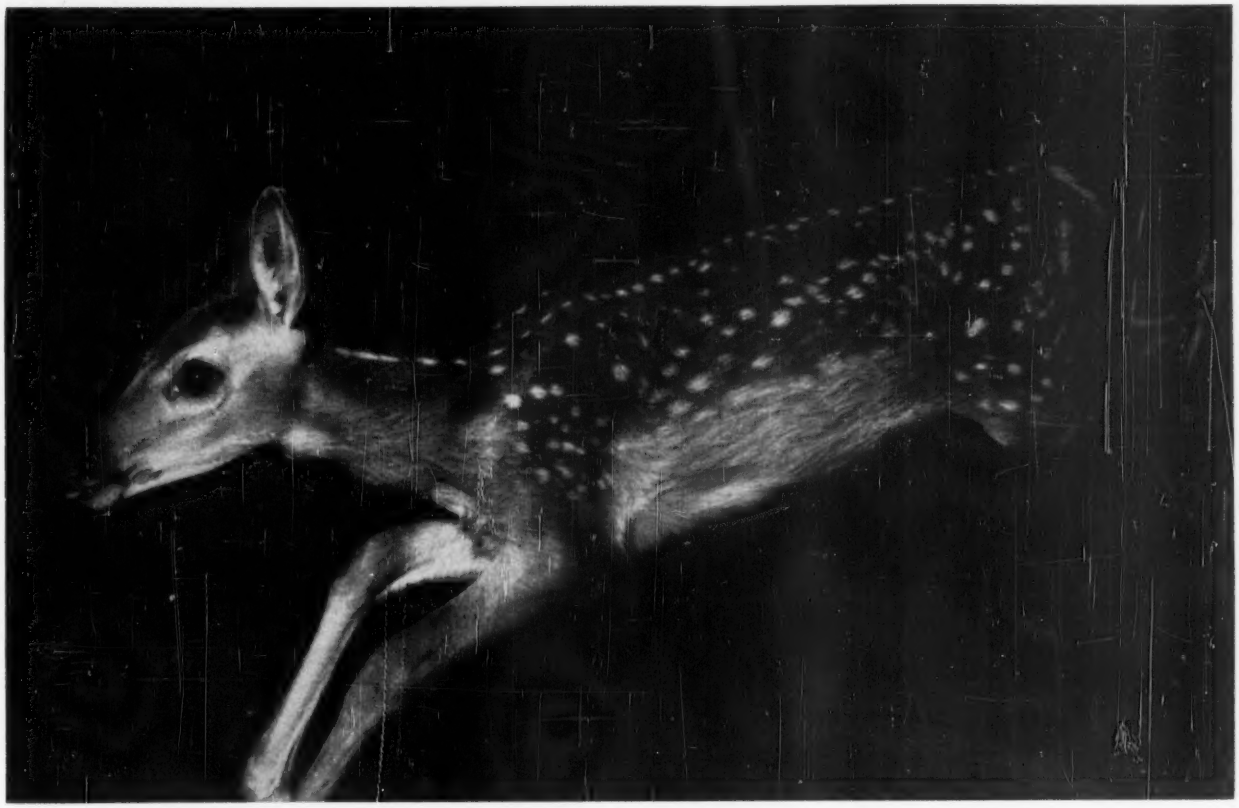
Far into the autumn the chipmunks were abroad. But finally came a day when they had settled down for their winter's sleep. Chipmunks, however, do not go into deep hibernation as the woodchuck does, and thus the need for a well-stocked larder. A sunny winter's day may bring one of these little creatures on a brief jaunt into the cold world above ground. All the following winter I would from time to time come across the elfin tracks of Chuck-chuck or her offspring, tracing a dainty pattern across the blanketing snow.

As a footnote to the story of Chuck-chuck, I might add that my acquaintance with her took place during an ebb in the local population of her kind. That year she held undisputed sway in her small kingdom. And the following summer a female chipmunk and her babies seemed to be sole occupants of our grounds. But, as with many other creatures, particularly in the rodent family, chipmunk populations fluctuate, rising and falling in a well-defined cycle. This year there are chipmunks everywhere. One of them has established headquarters on the terrace. And I like to believe that this engaging sprite, who today at my approach jumps on the stone wall for handouts, is Chuck-chuck. At any rate, this year's chipmunk answers eagerly to the name.

BROWN THRASHER AT DUSK

By Allen E. Woodall

Prairie rain and the evening sun
Already gone, and the gray, undone
March of the clouds, yet still the night
Waits beyond in the strange blue light
Of another hour, and against the sky
On a slender wire serene and high,
With his long silhouette and cinnamon coat,
And the bubbling song in his speckled throat,
A thrasher there in the falling rain
Of the twilight mood across the plain.



The spotted coat of a fawn serves as a camouflage before the animal is able to run. After a few weeks, however, the fawn is able to out-run most of its natural enemies, and the spotted coat disappears in the fall.

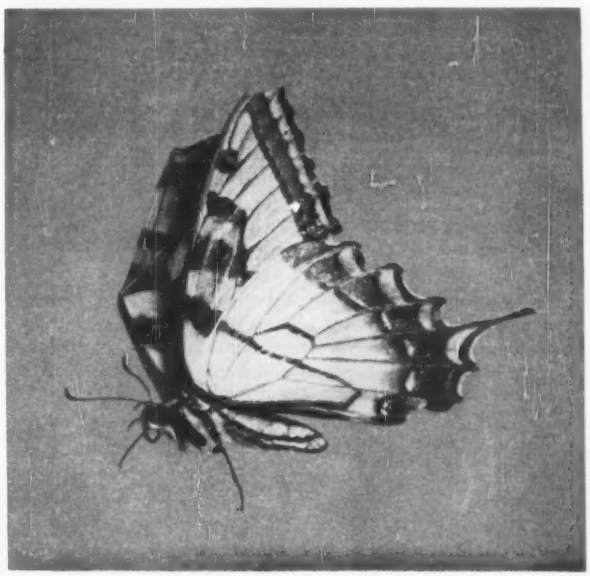
Animals in Action

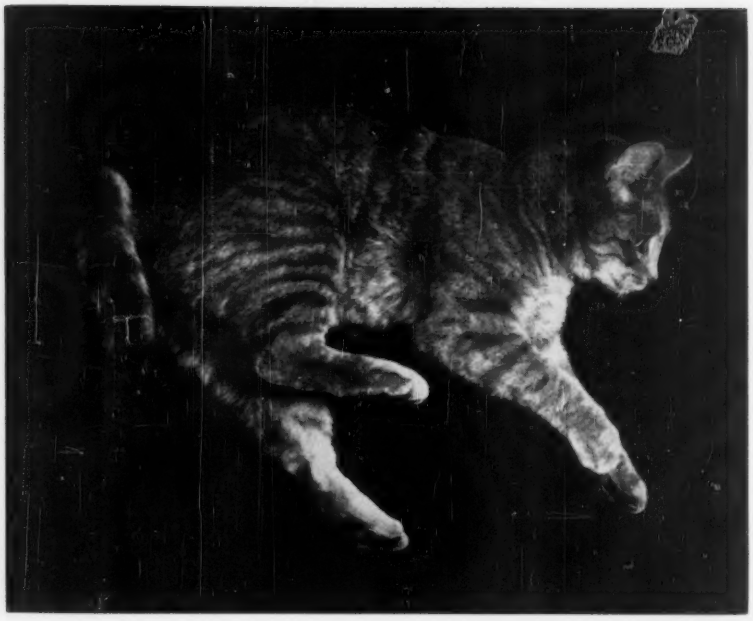
Photographs by Leonard Lee Rue III, from Three Lions.

ONE of the gifts of Nature to its various creatures is movement. Everything from the one-celled amoeba to the elephant is capable of some form of mobility. Animals, for instance, may shift, stretch, crawl, walk, jump, run, swim or fly, and sometimes indulge in more than one of these forms of motion. The speed of the movement varies considerably from creature to creature. Some are ponderously slow and clumsy, like the turtle. Some are lightning fast like the fawn, the antelope or the rabbit. Some move with the utmost of grace and agility, like the ordinary cat, while some creatures have a quickness all out of proportion to their form, like the frog. Some, like the butterfly, move with a poetic loveliness.

The remarkable thing about the movement of Nature's various living organisms is that no two of them move alike. These photographs, taken by naturalist Leonard Lee Rue III, depict the individual motions of some of the more common members of the animal kingdom. For the most part, the specific kind of motion peculiar to each is the motion that the creature needs to survive in the intricate pattern of life.

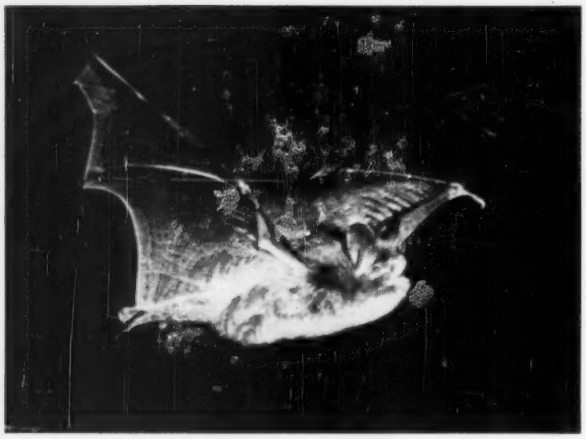
A butterfly emerges from the chrysalid stage, and transforms itself into an object of beauty. The wings grow rapidly, and are gently fanned back and forth to dry.

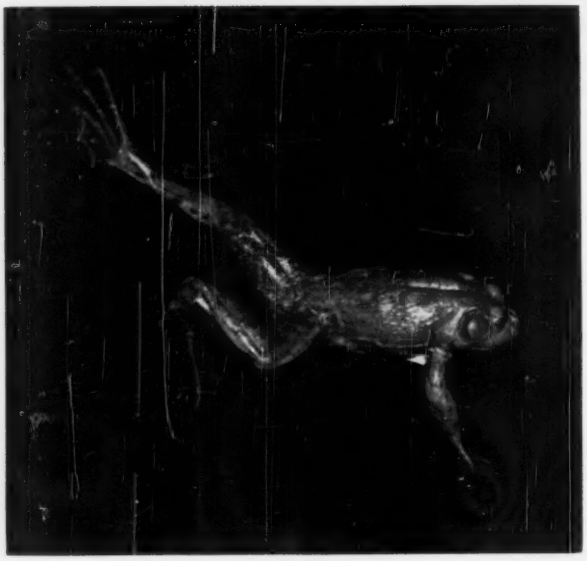




The wonderful agility of the cat, and its facility for landing on its feet no matter how it jumps or falls, has become legendary, and has doubtless contributed to the myth of the cat's "nine lives."

The bat is the only flying mammal and is remarkable for its dexterity of flight, dodging, twisting and turning through the night without striking stationary objects.





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The frog makes good use of its legs, either to prey upon insects, which it catches by jumping, or to escape other predators. Seldom venturing farther than a long jump away from the edge of water, the frog seeks the safety of the depths when disturbed or in danger.

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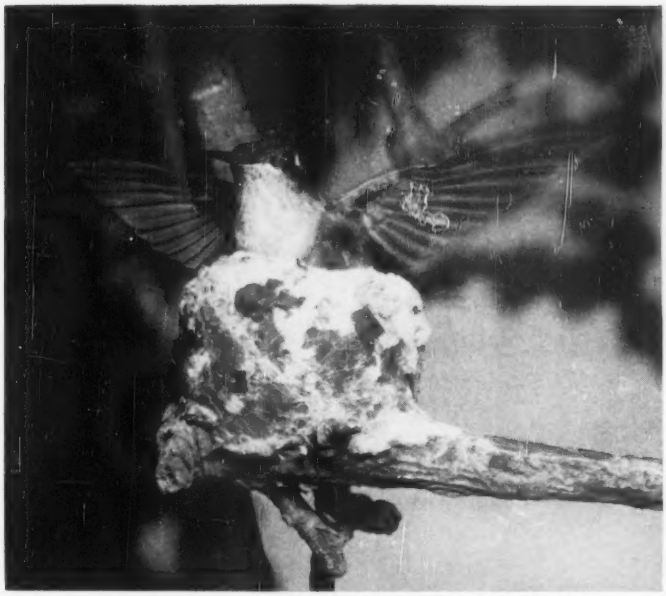
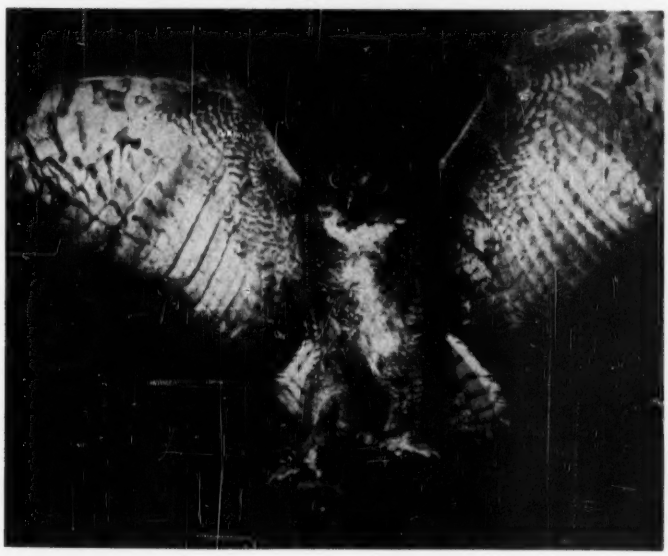


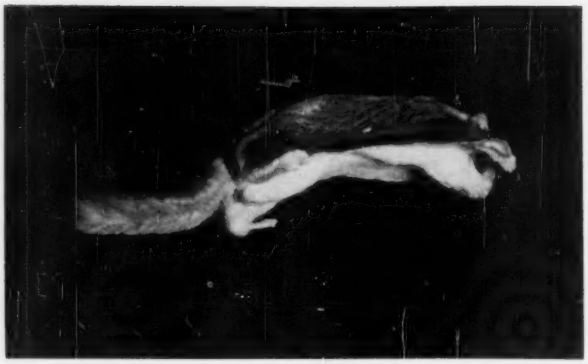
Moving on wings that beat with incredible speed, the hummingbird is able to fly up, down, or backwards. The wing movement of the illustrated bird has been completely stopped by a photographic flash duration of one forty-thousandth of a second.

Butterflies and moths move with poetic abandon and grace. Pictured is a male luna moth, which may be identified by antennae that are some three times as long as those of the female.

Hunting at night on softly feathered wings, the great horned owl strikes its prey like a bolt from the dark.



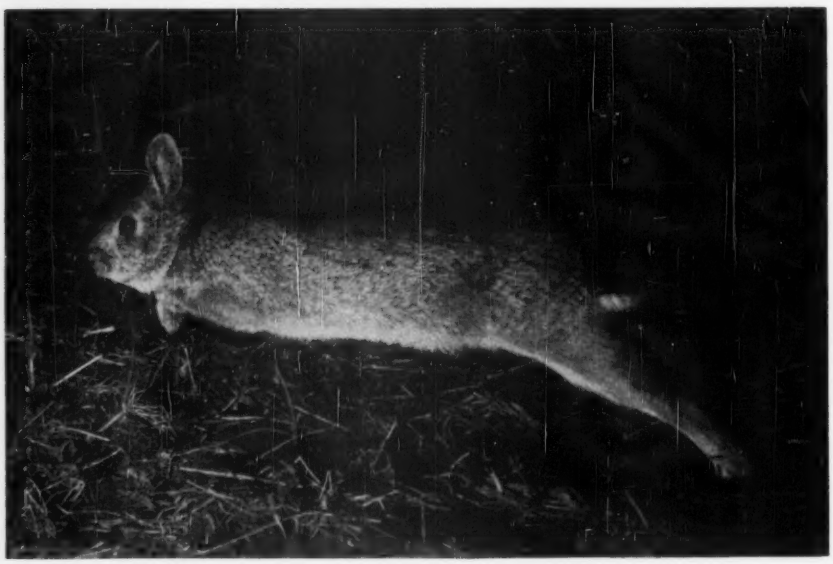
The wings of the hover fly move so fast that they are all but invisible, and allow the insect to remain stationary in the air when it so desires.



The flying squirrel is not capable of true flight, but the webs of skin stretched taut between the animal's extended legs enable it to glide for considerable distances.

When a flying squirrel is about to land on a tree, its legs are brought forward and the webs are employed as brakes. The squirrel must, of course, gain height before starting its next glide.

When frightened, the muskrat plunges into the water to seek the safety of its den, which is gained by means of an under-water entrance. Although the muskrat is well fitted for an aquatic life, it still must have access to air.



Although the cottontail rabbit is not extremely fast, its first dash usually places it in the safety of a nearby thicket. Under some circumstances rabbits prefer to "freeze," and escape detection by remaining motionless.

Mr. H. Albert Hochbaum, at right, is director of the Delta Waterfowl Research Station at Delta, Manitoba. The Station is located just north of Portage la Prairie on Delta Marsh, one of the shrinking remnants of glacial Lake Agassiz.

Crossroads of the Duck World

By LYN HARRINGTON

Photographs by Richard Harrington, from Three Lions.

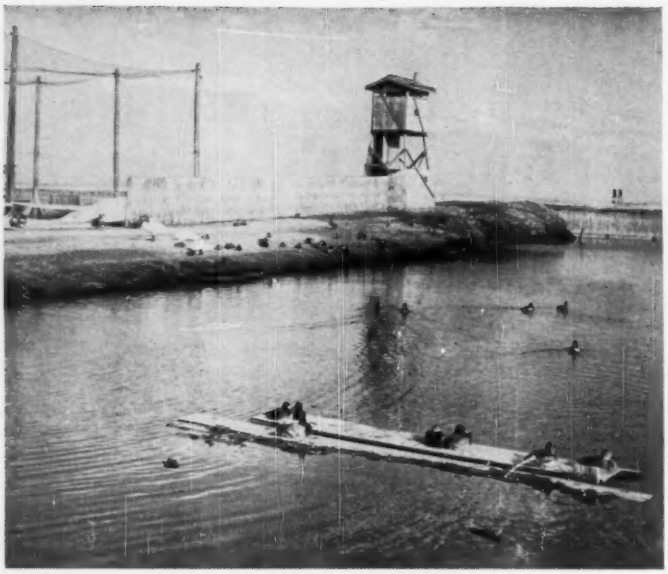
NORTH FROM the Gulf of Mexico, the Mississippi flyway fans out across the great plains and tundra to Alaska and Baffin Island. This country of sloughs and potholes and marshes annually provides nesting-grounds for millions of waterfowl.

The marshes of Manitoba, shrinking remnants of glacial Lake Agassiz, are a crossroads of the duck world. Delta Marsh, one of the largest units, lies just north of Portage la Prairie. An ideal location for the study of bird life, it is the site of Delta Waterfowl Research Station, of which Mr. H. Albert Hochbaum has been director since 1938.

"Delta is unique in providing excellent research facilities along with a wide range of habitat," Mr. Hochbaum says. "We can study the birds in their natural setting of open lake, sheltered bay, farmland, woods and marsh all within a few miles. The Station area itself takes in about one square mile, and we own two quarter-sections reserved for study areas."

Directly opposite the Lodge is the hatchery, a large gray building containing incubators and batteries of brooders. A new laboratory angles off it, opening to the enclosed Station pond and a netted flight pen for a few

Joan Hochbaum stands among the tall reeds of Delta Marsh. These grow to a height of seven feet or more, providing excellent cover for waterfowl.



An odd-looking observation tower called "the gazebo," built of reeds from the marsh, overlooks the station pond, the flight pen, and the marsh. The little room affords protection and privacy for the observer while he is "spying" on the activities of waterfowl.

pinioned birds. An odd-looking tower built of marsh reeds rises on the far bank, the "gazebo" used for spying on waterfowl. And opening into the pond from the opposite corner is a tunnel decoy, a netted cornucopia that leads to a slatted trap.

The Station pond is something of a showplace. It is the one section of the work readily visible to the public. Visitors gaze admiringly over the reed fencing at the brilliant wood ducks, swans, Canada geese and other members of the flock.

The function of the Research Station is "to study ducks at their source, to serve as a clearing-house for information, and direct such knowledge to useful ends in field biology"—activities that have proved most valuable.

The work of the small permanent staff at Delta and that of visiting biologists covers inventory, ecology, behavior and physiology. They are all interrelated.

"You might say that the work here falls into two large divisions," Mr. Hochbaum says. "The breeding behavior of waterfowl, and marsh ecology. Some projects can be completed in a season or two. Most take longer."

The Station at Delta started as a private project by James Ford Bell, of Minneapolis. His idea was to hatch duck eggs and release the young birds over the marsh. In a few years, he began to realize what such a setting could mean to science, and in 1938 he turned over his buildings and some property as a research station. The

In the photograph at left, Ronald Balham, University of Missouri student on grant from New Zealand, makes a special study of wild geese from his reed blind in the marsh. Below, a biologist punctures a waterfowl egg with a hypodermic needle to inject aniline dye. The result will be a colored chick that can be identified and studied.

The road through the flat, wet marsh was made by dredging "borrow" ditches that seem like canals. On top of the car in the background is a canoe for use in the marsh, while the man in the right background carries a duck blind.

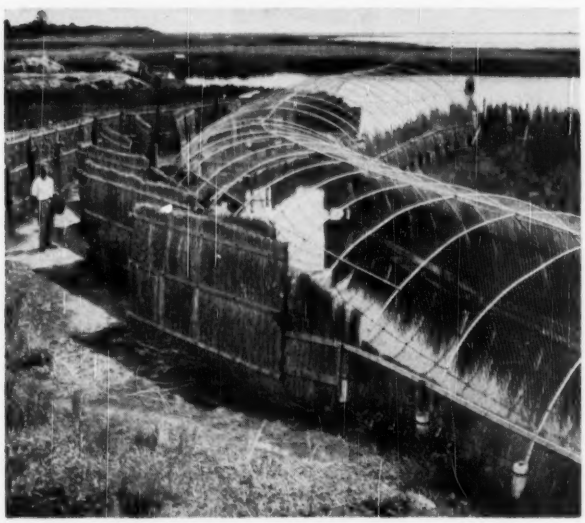
Station limped along on a skimpy budget until 1950, when sponsorship was assumed by the North American Wildlife Foundation. This group, with its board of directors from both Canada and the United States, stimulated a drive for more operating funds from both Canadian and United States sources. One Montreal businessman provided funds for the library and a span of university fellowships; a group of Winnipeg businessmen pooled their funds for purchase of land for the special study area; and each year Canadian and U.S. supporters contribute enough funds to maintain the Station operation. The work is directed by the Wildlife Management Institute of Washington, D.C.

Each year eight to ten graduate students come to Delta to carry out original studies toward their advanced degrees. At first, the student works on projects already in hand, gaining a broad and varied background before going on to an approval project of his own.

Naturally, hundreds of applications come from bird watchers and Nature enthusiasts. But all must go through the regular channels of a university wildlife course, and a professor's recommendation. Although most students have come from universities in the United States, many are from Canada, some from England, and some even from New Zealand.

Most Station projects are carried on right at Delta, with its fine facilities and its variety of habitat. However, four sub-stations have been set up in Manitoba, and one at Brooks, Alberta.

At the right, Nan Mulder sets out one of the mallard nests in the shallow pond, wiring it to a post. Peter Scott also perfected the design of the duck decoy (photograph below), which is cornucopia-shaped and covered with mesh. The ducks are lured up the decoy and into a trapping-box by grain scattered in the water.



Nan Mulder, a Dutchman, brought to Canada his generations-old knowledge of making straw nests for mallards. Dutch mallard nests like this are manufactured of straw and set on stakes in the pond as well as being scattered over the marsh.

The legs and feet in the foreground belong to a scientist from the Cornell University Animal Behavior Farm at Ithaca, New York. The scientist is studying "imprinting"—what makes an impression on a day-old chick. These chicks are trained to follow.

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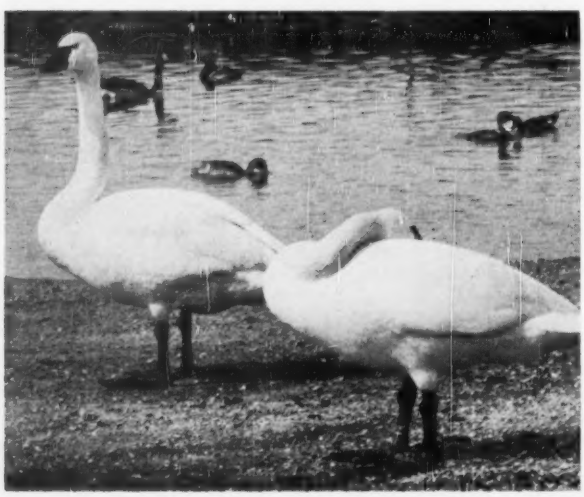
Delta Marsh, with its many varieties of waterfowl, lures numerous artists, including names like Richard Bishop, Lee Jacques, and Peter Scott of England. Mr. Hochbuam himself is a talented amateur, and is seen below with his wife and one of his young sons.

These two whistling swans, crippled by gunners, make their home at the Station. Their haunting "take-off" calls sound throughout the night when their relatives are flying overhead.



Challenge to the States

An Editorial

FOLLOWING the passage by the 85th Congress of the amendment to the Federal Highway Act of 1956 to encourage control of outdoor advertising along the system of Interstate and Defense Highways, many people believe that the goal has been achieved. They think that we can look forward to safe and enjoyable travel on these highways, and to effective protection of the vast public investment in them. They envision modern, limited-access, high-speed highways free of the parasitic distraction of advertising signs, as a result of the Federal action.

This is not the case—not yet, or by a long-long shot. Why not?

Under the terms of the amendment the Secretary of Commerce was directed to draft standards within the limitations of the Act. The authorities labored mightily to do so, and finally announced a set of standards that were about as good, in the main, as could be expected. However, these reflected the inadequacies of the amendment itself, which President Eisenhower declared, in signing it, fell short of the proper goal and should be amended by the 86th Congress.

The Department was confronted by two legislative nuts to crack. One of these authorized signs "advertising activities being conducted at a location within twelve miles of the point where signs are located." The other gave blessing to the signs "designed to give information in the specific interest of the traveling public." The problem was how to fit these into a set of standards that would achieve some control within protected areas extending back 660 feet from the edge of the right-of-way.

These limitations were met by establishing two classes of signs, creating informational sites, and limiting the size of signs. The standards also placed limitations on the number of signs. None is permitted within two miles of the approach side of an interchange, although they may be erected on the other side of the highway going away from the same interchange. There may be no more than six signs, none less than 1000 feet apart, in the mileage between two and five miles of the approach to an interchange, and elsewhere in protected areas an average of not more than one sign to a mile, with the 1000-foot spacing applying. Such permitted signs may not be larger than ten feet high or sixty square feet in area, and the services or activities advertised must not be dominated by any brand name. The size stipulation eliminates the large "standardized" billboards.

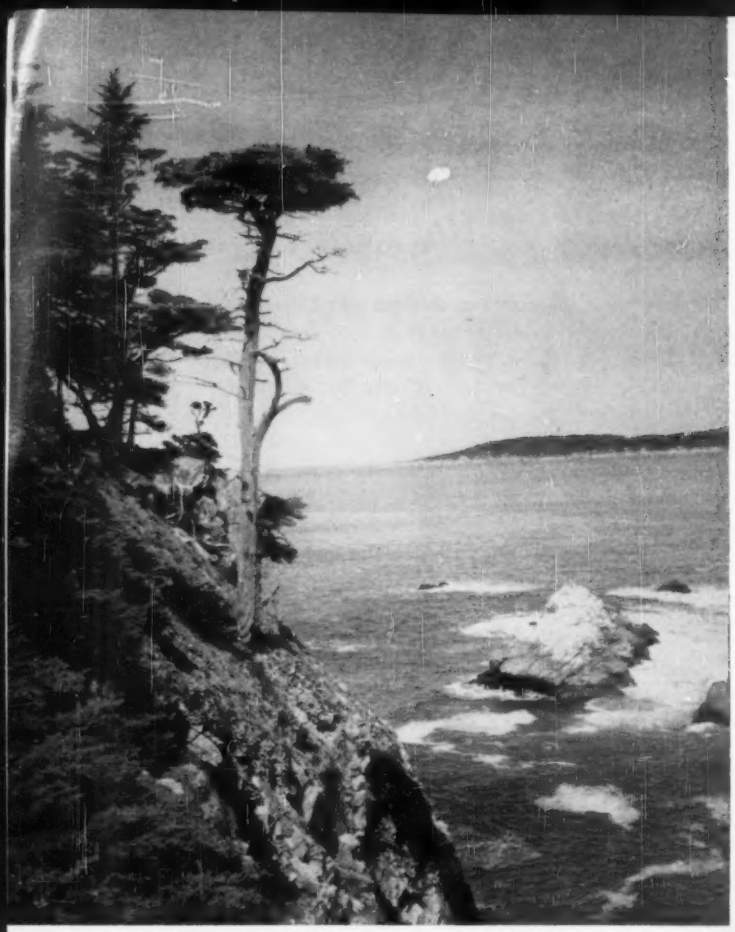
Informational sites would provide for one or more panel signs, visible but not legible from the highway, on which services of value to the motoring public would be advertised. Individual advertisements on these panels would not be larger than twelve square feet, or the panel larger than thirteen feet by twenty-five feet. This would allow about twenty-four announcements on a panel. Signs may have no animated or moving parts and may be illuminated only by white light. Permitted signs in protected areas along the highways may not resemble or obstruct official signs, be animated in any way, cause glare to the motorist, or be placed on trees, rocks or other natural features.

On the Senate floor Senator Cotton of New Hampshire offered and had adopted a complicating amendment providing that the standards would apply only to Interstate Highway mileage *the entire width of which* was acquired subsequent to July 1, 1956. Thus, if a certain mileage of highway is improved and widened to Interstate Highway specifications, the fact that part of it dated back before the prescribed date would prevent protection of any part of the highway. An amendment by Senator Case of South Dakota might, in part, cancel the effect of the Cotton proposal since it provided that the Federal incentive payment would apply only to that mileage that is protected. This places a premium on protection—the more protection the more money.

Excellent as they are under the limitations of the law, therefore, the standards reveal many problems of administration and interpretation. These, we may be sure, will be seized upon by the outdoor advertising interests as an opportunity to toss as many monkey-wrenches as possible into the machinery. Therefore strengthening of the law, as urged by Mr. Eisenhower, should be sought quickly at the next Congress.

There is one provision lacking from the standards—one that was urged by several organizations and individuals—and that is a brief statement that these standards do not inhibit the right of the States to enact more direct and stronger legislation. In other words, minimum compliance with the Federal Act and its standards *are not* a limiting factor. States may go farther, as Maryland has done, and prohibit signs within 600 feet (to be amended to 660 feet) of its expressways.

This, indeed, should be the State objective. Strong laws will be fought by the advertising interests at the State level, and fought hard. But if we are to safeguard the vast economic investment in these highways, and assure safe and enjoyable travel over them, the issue must be faced squarely. We are able to travel today over hundreds of miles of turnpikes, most of which mileage is wisely protected from the deteriorating and distracting effects of outdoor advertising. The motorist has adjusted to such absence of advertising signs. He will quickly do so without eventual detriment to service businesses if the States will recognize their responsibility to the traveling public and enact strong laws and apply strong standards.



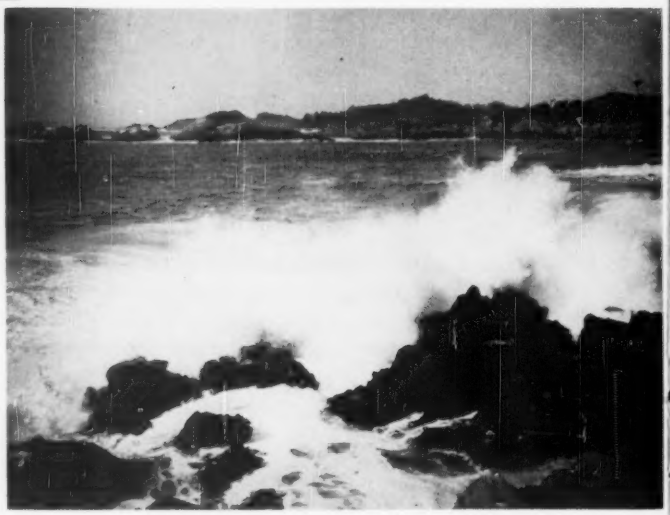
Point of the Sea Wolves

By WELDON F. HEALD

Photographs by the Author

A child of the cool, wet fogs and ocean spray, the Monterey cypress, rarest conifer in North America, seldom is found more than 350 feet from the shore.

Point Lobos, three miles south of Carmel, California, has been described as "the greatest meeting place of land and sea on earth."



THERE ARE some places in the world where Nature has achieved perfection. Not one thing need be added or taken away to enhance their value or completeness. They sparkle like rare and flawless gems and constitute the crown jewels of our magnificent natural heritage. Such a place is Point Lobos.

Described as "the greatest meeting place of land and sea on earth," this wild, picturesque promontory on the central California coast juts boldly into the Pacific, flanked by rocky islets and wooded with groves of cypress and pine. Here there is a spectacular combination of ocean shore and vegetation that has transcendent beauty and exceptional scientific interest. It is a terrestrial outpost forever dominated by the sights, sounds and smells of the sea. The air is redolent of salt, banks of fog roll in to envelop everything in damp opaque whiteness, and always is heard the thunder of surf, the bellowing of sea lions, and the wheeling cries of marine birds.

But perhaps best of all is the fact that this primitive bit of original America is little disturbed by man. Realizing the area's outstanding scenic, botanical and geological importance, the people of California wisely moved to preserve it in a natural state for the enjoyment and inspiration of the public. So the entire promontory is included in a State park reserve of 450 acres, which includes three and one-half miles of ocean frontage.

Point Lobos is seven miles south of Monterey and three miles south of Carmel, and forms the southern headland of curving, pine-fringed Carmel Bay. It is thus within the twelve-mile stretch of rugged, forest-clad shoreline that is the most hauntingly beautiful on the California coast. But it is doubtful if today this charming spot would be a carefully protected and famous area were it not for its grove of Monterey cypresses. These alone set Point Lobos apart, and give it distinction as one of the continent's exceptional places.

For the Monterey cypress is the rarest conifer in North America, and certainly the most mysterious. Probably no other tree has such a limited natural range. In its native state, it is confined to two restricted groves on the

California coast. One of these is at Cypress Point on the Monterey Peninsula, north of Carmel Bay, and the other is on Point Lobos. In 1929 the number of trees in the peninsula grove was rather carefully estimated to be 10,550, while the Point Lobos stand is much smaller and contains far fewer individuals. But the latter are the more important from a botanical point of view, because they are the only remaining trees relatively unaffected by human activities and development.

However, it is not only rarity that distinguishes the Monterey cypress. This remarkable tree is unusual in almost all of its characteristics. A child of cool, wet fogs and ocean spray, it is seldom found more than 350 feet inland, and is apparently incapable of extending its natural range. Yet it has been planted in both hemispheres throughout the world, and is a familiar sight in California hedges, windbreaks, parks and gardens. In cultivation it often attains a height of seventy-five feet, with aspiring, arrowy branches carrying thick, lustrous green foliage.

But these fast-growing, short-lived alien cypresses are barely recognizable as descendents of the tough, hard-bitten colony of natives clinging to life above the tempestous Pacific surf. Here, constant buffeting by the sea winds have twisted the trees into unbelievably grotesque and tortured shapes. Their tops are flattened, spreading and umbrella-like, and, in particularly exposed situations, the distorted limbs and even the short stocky trunks themselves sprawl horizontally along the ground. A remarkable feature of these veteran, wind-blasted trees is that many of the trunks are enormously elongated, so they are often only six to nine inches wide, but as much as a foot to nine feet broad.

Nowhere is there a more eerie, elfin wood, and it has the unreality of a Walt Disney fairyland, peopled by dwarfs, goblins and pixies. This other-world quality is heightened by the long, somber, gray beards of "moss," trailing from the branches and stirring listlessly in the breeze. Yet, on a brilliant sunny day, an ethereal, breath-catching loveliness resides in these extraordinary groves perched between the bright blue sky and the dark blue water.

On Point Lobos the cypresses are limited to a ragged fringe along the rough northern shore. There, for a distance of three-quarters of a mile, they cluster atop rocky headlands and around narrow coves. Many cling to the edge of the cliffs directly above the sea and are supported by long, writhing roots that grip the rocks and penetrate the meager soil. In protected spots behind the knolls, the cypresses grow thickly in miniature forests, where it is always strangely dim and damp, and footfalls are hushed by a bed of needles accumulated through the centuries. The branches of some of the trees, particularly those near the tip of the promontory, glow with a reddish-orange color, as if lighted from within. In places this ruddy blush is so prevalent that the effect is startling. It is caused by a living organism, called *Trentepohlia*, that invests outer limbs and twigs with a rusty, velvety, fungoid mass. However, it is a perching alga, not a parasitic plant, and does no harm to its cypress hosts.

It is natural that such provocative trees should become almost legendary. Their appearance of hoary age has given rise to estimates of longevity up to fifteen or twenty centuries. But, actually, probably none is more than 200 to 300 years old. Although a true cypress, labelled *Cupressus macrocarpa* by the botanists, some claim that these trees are really Cedars of Lebanon, carried to the New World in the Eighteenth Century by the pious Franciscan Fathers. Others relate that they were brought across the Pacific from Japan many hundreds of years ago by Buddhist monks, presumably by way of the lost continent of Mu.

But the facts are much more wonderful than the fiction. The Monterey cypress is a relic of past ages and a living link with former geological periods. During Pleistocene time, the tree flourished along the Pacific coast as far south as Mexico. Changing climates slowly exterminated the species throughout its range, until it is now apparently making a last-ditch stand in the pygmy

Another interesting tree of the Point Lobos area is the Monterey pine, indigenous to only three small areas within the fog belt of the central California coast. *Pinus radiata* is a fast-growing tree, reaching heights of from sixty to eighty feet in less than fifty years.

groves around Carmel Bay. So this is the final act of a botanical drama that began eons ago.

But why here and nowhere else? Probably we will never know. However, undoubtedly there is some mysterious quality in the climate of the Monterey Peninsula region, for it is a remarkable isolated arboreal island. Besides the Monterey cypress, it harbors three other cone-bearing trees of extremely limited extent that were once much more widely distributed. These are the Monterey and Bishop pines, and the Gowen cypress. In the nearby Santa Lucia Mountains, too, is the rare Santa Lucia fir, and the sea-facing canyons of the range contain the southernmost stand of the coast redwood—another relic of ancient times.

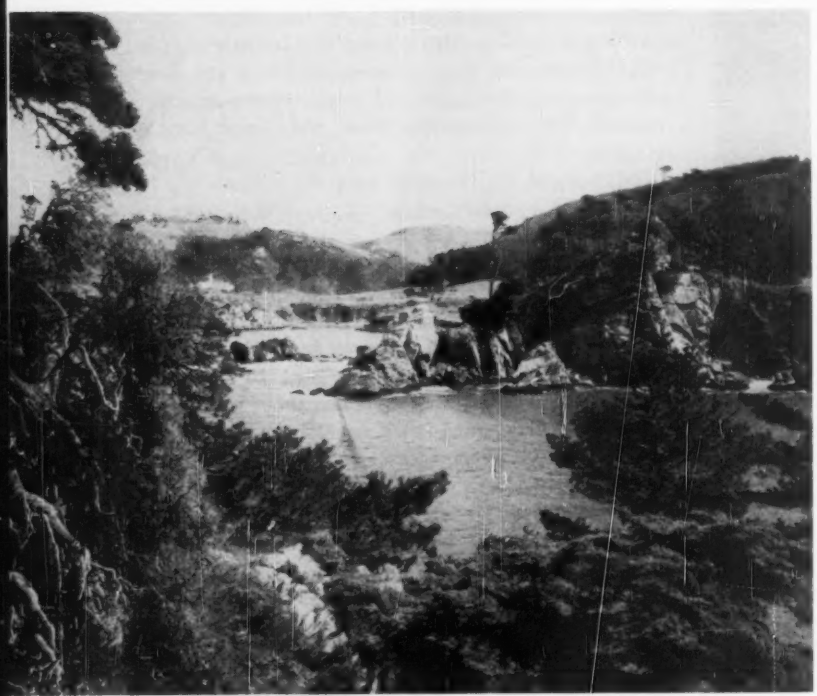
In fact, around Monterey Nature seems to be in a particularly theatrical mood, and reaches a climax of concentrated showmanship at Point Lobos. Roughly triangular, about a mile to a side, the promontory is an epically dramatic bit of coast. The north shore is rough and deeply sea-bitten. Centuries of crashing waves have eaten into the granite rock and formed jagged points, indented coves, and numerous offshore islets. Elevations are highest here and the fifty- to 100-foot cliffs culminate inland in Whalers Knoll, 240 feet above the sea. The remainder is rolling grassland alternating with scattered pine woods. It slopes gently down to the southwestern shore which, while not as high as the northern, is yet rocky and irregular.

Clasped in the arms of the sea, this enchanting area seems aloof from the land behind it, and is a complete, self-contained little world in itself. Perhaps the sense of seclusion and independence gives Point Lobos its peculiar charm. There is a fresh naturalness about it, and plants, mammals and birds follow their original ways, apparently unaware as yet that Man owns the earth. Even statistics about the rich, teeming life on land, in the sea and air are impressive and revealing. Naturalists have listed more than 300 species of trees, shrubs and flowering plants; 178 species of vertebrate animals, including nineteen mammals; ten different amphibians and reptiles; and 147 species of birds, of which more than a quarter owe their presence to the influence of the sea. Also along the shore and in tidal pools are eighty-eight species of marine invertebrates, as well as many varieties of seaweed and salt-water algae.

The birds of Point Lobos are bewildering in their variety, and there are said to be more species found here than in any other region of California. The avian population is greater in winter and spring than during the summer, but throughout the year the chittering of pigeon guillemots and the cries of terns and gulls mingle with the songs of such dwellers of field and woodland as the white-crowned sparrow, meadowlark, warbler and hermit thrush. This is the northernmost breeding place of the brown pelican, and Bird Island, off the south shore, is the permanent home of about 200 of these big, awkward birds. In late fall, as many as 3000 visiting pelicans may be seen clustered together on the rocks. Brandt's cormorants, however, are usually the commonest ocean bird, and an estimated 300 to 500 individuals live and nest on the seaward side of cliffs and islets.

Fascinating, too, is the Point Lobos shoreline, between high and low tides. In this transition zone of land and water live myriad creatures of all shapes and sizes. Most of the animals and plants are bright-colored, and the hideous and beautiful are equally at home. Here crabs, lobsters, octopuses and jellyfishes slither and crawl among subaqueous gardens of sea anenomes, sponges, algae, and waving fronds of kelp. There are a half-dozen interesting small sea caves, mostly around Sand Hill Cove, on the southwestern side, and some fifteen tunnels, natural bridges, windows and double-ended caves. Several delightful little sandy beaches, too, are tucked away between the cliffs.

But the biggest marine spectacle is staged by the sea lions. Called "wolves" by the Spaniards, their prevalence gave the promontory its original name, *Punta de los Lobos Marinos*—Point of the Sea Wolves. The offshore rocks and islands are inhabited by thriving herds of this close relative of the seal. Of the two kinds found here—Steller's and California—the



Around Monterey, Nature seems to be in a particularly dramatic mood, reaching a climax of showmanship in the Point Lobos State Park reserve area.

Point Lobos cypresses often cling to the rugged headlands directly above the water, their wind-blown tops flat and umbrella-like.

former is the world's largest sea lion, and the average weight of an adult male is 1400 pounds, with a length of ten to eleven feet. Almost everywhere their yelping, growling and barking can be heard, and from the outer headlands, facing the open ocean, one can usually see scores of them sunning themselves on the rocks or sporting in the breakers.

On the land, the parade of the seasons brings a changing pageant of color. In winter the grass is lush and emerald green, turning to yellow-brown during the long rainless summer. The first wildflower displays begin in March, with a brilliant orange-tinted carpet of golden poppies, California's State flower. This is followed by the blues of lupines and ceanothus, the yellow of buttercups, the red of Indian paintbrush, and the variegated hues of a host of other blooms.

Of the trees, the Monterey pine, *Pinus radiata*, is almost as interesting as the cypress. Fast-growing, it reaches heights of sixty to eighty feet in less than fifty years, and is abundantly planted all over the world. In fact, it has become a valuable source of timber in South America and Australia. However, this pine is indigenous only to three small areas, all within the fog belt of the central California coast. Largest stand is on the Monterey Peninsula and around Carmel Bay, where an almost continuous forest contributes greatly to the charm of the area. On Point Lobos, pine groves are limited to the southern and eastern parts, where the trees grow tall and straight in sunny, open woods. There are also scattered individuals here and there with large spreading branches and rounded crowns of dark green foliage. A few cling to the northern cliffs and are stunted, windblown and twisted, closely resembling the neighboring cypresses.

Like the cypresses, the pines are hung with long festoons of misnamed Spanish moss, in reality a lace lichen named *Ramalina reticulata*. This funereal decoration tends to give the Monterey forest a gray and mournful look, especially when shrouded in fog, and Robert Louis Stevenson called it "the kind of wood for murderers to crawl among." The British novelist, essayist and poet stayed at Monterey in 1879, and became so enamored of this coast with its fringe of pine forests that he used a similar setting in *Treasure Island*.

The Monterey region has been called "the cradle of California's History," and it is strange indeed that the little promontory at its southern end has escaped human development, to remain almost in natural condition.

Once a part of a Mexican land grant dating from 1839, the promontory suffered the vicissitudes of private ownership for nearly a century. A gleaming white ninety-foot whale skeleton among the dark green cypresses attests that whaling was an important industry in the past century. Then Japanese fishermen and divers were brought here to help develop an abalone cannery at Carmelo Cove, on the north shore. At one time there was an active quarry at Granite Point; several times gold-mining prospects caused flurries of excitement; and near the turn of the century the whole point was laid out as an ambitious resort community, with a rigid gridiron of streets and lots. This fortunately failed.

Yet the area somehow remained relatively unspoiled, and the State was able to purchase it, in 1932, for $631,-000. With the transfer of title a year later went a gift of fifteen acres on scenic Cypress Headland, now a memorial to the former sympathetic owner, A. M. Allen, and his wife, Satie Morgan Allen. Upon the establishment of the Point Lobos Reserve State Park as a unit of the California State park system, a master plan was devised under the direction of the late Frederick Law Olmsted. This states that its aim is "to keep at a high level of perfection the unique natural conditions upon which the greatest values of Point Lobos depend, in order to make these permanently available for the enjoyment, education and inspiration of the public."

California has kept the faith. The finer areas can be entered only on foot, and today one can wander the unobtrusive trails of Point Lobos, feel the stimulating tang of salt-air, listen to the mingled wild sounds of land and sea, and revel in as lovely a spot as God has ever made.

Stories in the "Snow"

By RUTH K. STROH

Photographs by the Author

Pictures, books, and animal cut-outs may be used to supplement track impressions in permanent displays. ←

The mammal and bird tracks in the illustration below have been painted with black poster paint to increase the appearance of depth. Tracks are in starch.

Most Nature-study units in the curriculum deal at some time with the tracks made by animals in winter. Children are endlessly fascinated and curious about such "trademarks" of Nature. Although city school children perhaps need more guidance than rural pupils, all children like to learn more about their friends of the forest and field by representing animal tracks in various art media.

Many primary grades have a unit's work in winter months on the identification of animals by their prints, in which careful and quiet observations are encouraged. Mud prints may be cast in plaster by older children, but the younger ones enjoy making copies of prints either found, or discovered, in texts. For them, the techniques utilizing starch, flour, and flour doughs are easier and quite effective.

The object of using such materials is to simulate snow and typical wintry scenery, when animal tracks are so much in evidence. Simple and inexpensive materials offer the pupils an interesting and educational way of setting up "pretend tracks in the snow." Starch may be poured thickly (about three-quarters of an inch) in a tray. When hard, black or gray paint may be used to "paint on" the tracks to give a feeling of depth. Or pupils may use their fingers and push into the starch before it has completely hardened, to give their imprints real depth. Smooth and white, the starch offers an ideal painting surface.

When dry flour is the medium used, children simply press lightly into the mock snow, and simulate tracks—big tracks are ideal, in this case. Such tracks may be erased, and others made. They are quite realistic, and have depth, as in Nature.

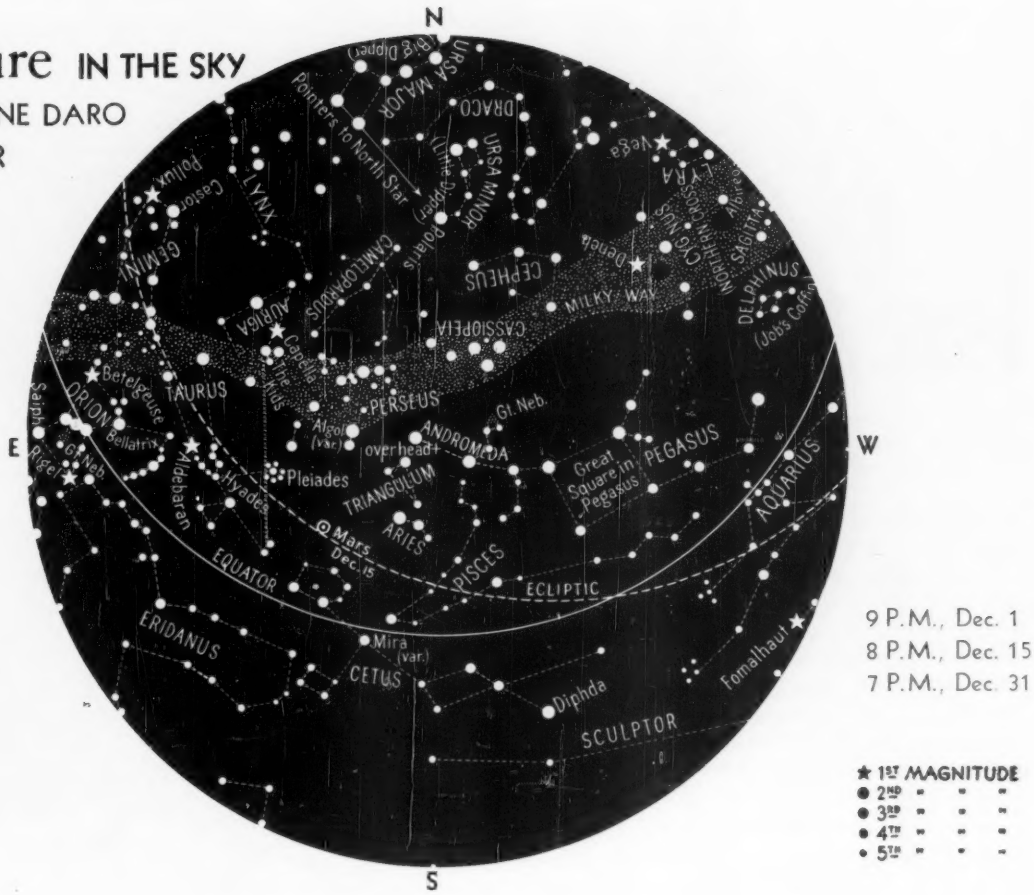
Flour dough made of two parts flour and one part salt, with a teaspoon of powdered alum per cup of salt and enough water to make the mixture doughy makes a "snow" that will harden, and with its impressions may become a subject for the science shelf. After smoothing the mixture on a board or in a tray, and perhaps sticking in a few twigs or berried branches, small wooden spoons—or hands and fingers—are used to make impressions of animal tracks. These harden, and are usually painted dark. Some feel that the tracks are more natural if left light, yet they certainly stand out more boldly, and are more easily recognized, if painted a darker shade. If the flour mixture takes on a somewhat yellowish cast, a coat or two of white poster paint restores the snowy hue.

Such projects are lessons in themselves, correlating science and art and, wherever possible, utilizing child observations and knowledge with as much accuracy as possible. These activities may become part of permanent exhibits. They may be enhanced by a backdrop of a winter scene, a three-dimensional scene with animal cut-outs, or pictures and books. A sprinkling of dry flour over all, and a few tree branches or evergreens "touched up" with white-painted "snow," make a fine setting. An entire class play table, science table, or corner may house the winter animal projects.

Children are most enthusiastic about the proceedings. They remember the tracks longer if the tracks are connected with the animals that made them. And, for the children, such a program is a fascinating way of encouraging a keener observation of the world of Nature.

Nature IN THE SKY

By SIMONE DARO GOSSNER



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

The Pulkovo Observatory

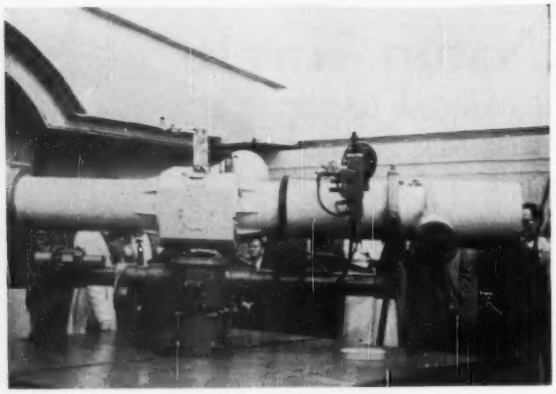
THE ASTRONOMERS who attended the Tenth General Assembly of the International Astronomical Union, held at Moscow last August (see *Nature Magazine* for August-September, 1958), were invited by the Russian Academy of Sciences to spend two days in Leningrad, in the course of which a detailed visit to the Pulkovo observatory was organized.

Pulkovo is a small village located about twelve miles south of Leningrad. The observatory was the first landmark we saw as my colleagues and I disembarked from the Soviet airplane that had brought us from Helsinki.

It is the oldest Russian observatory in existence today. It is also the largest. It was first dedicated on its present site in August of 1839. Under the leadership of William and Otto Struve, it soon became one of the most famous observatories in the world. Having survived World War I and gone unharmed during the Russian revolution of 1917, it did not fare as well during World War II. Soon after the German invasion of 1941, it found itself within less than a mile from the principal line of defense of the city of Leningrad. The staff was able to evacuate a few of the instruments and the most precious volumes in the library—in particular, the original works of Johannes Kepler for which it had been noted. The rest was totally destroyed.

One of the first concerns of the Russian Academy of Sciences at the end of the war was the reconstruction of the observatory. The work started almost immediately, and astronomical observations were resumed almost as fast as each instrument was installed. Old instruments were salvaged and modernized. New ones were built to conform to the most modern designs in

This is a general view of the main buildings of Pulkovo, oldest and largest of Russian observatories. It was almost totally destroyed during the second world war.



Among the noteworthy instruments at Pulkovo is the Linnik double-beam interferometer to measure the horizontal component of angular separation of double stars.

existence elsewhere. Surrounding land was annexed to triple the area available.

By the spring of 1954 the reconstruction work was sufficiently advanced to permit the dedication of the newly rebuilt observatory. About fifty foreign astronomers were invited to the ceremony, including two from the United States (there were one hundred and sixty-five Americans among the delegates who attended the meeting last August). In the four years since the dedication, the expansion of the observatory has continued steadily.

At present, there are about twenty instruments in operation, not counting those in use at the sub-stations of Nicolaiev and Crimea. The observatory is also in the process of establishing a sub-station for the observation of latitude at Blagoveshchensk-on-Amur, near the Chinese-Siberian border.

As we arrived at Pulkovo, we were greeted by its director, A. A. Mikhailov, who gave a brief lecture on the administrative organization of the observatory and on the principal research projects. The lecture hall, of which the staff is proud, is an unexpectedly formal room, with white marble walls, crystal chandeliers and red velvet draperies. To western eyes, it looks oddly anachronistic in a building erected in the past decade.

After the lecture we formed small groups, according to language, and were escorted by a member of the staff on a visit of the grounds and of the principal instruments.

Our impressions were necessarily superficial: there was so much to see in so little time, but we could not fail to note the extraordinary diversity of the equipment. Western observatories prefer concentrating their efforts in one or two subjects. For example, Mount Wilson remains associated in our minds with extragalactic studies; Yerkes with spectral classification and astrophysics; Michigan with solar work, and so forth. Pulkovo, on the contrary, wants to branch off in every direction, and have everything from a solar coronagraph to a radio telescope. Whenever possible, it even tries to acquire two or three instruments of the same type. Only time will tell, of course, whether they will be able to use all their scientific equipment to its fullest potential.

PHOTOGRAPHS BY THE AUTHOR

A camera for the tracking of artificial satellites.

I was interested particularly by the double-beam interferometer designed by Linnik, and by the 400-foot radio telescope designed by Korolkov, among the less conventional instruments.

The Linnik interferometer is designed for the measurement of double stars. Actually, the instrument measures the horizontal component of the angular separation of double stars. The true separation and position angle are obtained by combining observations taken at various hour angles.

Korolkov has designed a rather unusual radio telescope in an attempt to overcome the technical difficulties and cost of constructing a large, fully steerable radio paraboloid. Korolkov's telescope is a long arc—more than 400 feet long—but only ten feet high, composed of individually adjustable segments of paraboloids of revolution. Technically, the long dimension makes it at present the largest radio telescope in the world. In spite of its size, however, it cannot sustain comparison with the 250-foot fully steerable radio telescope of Jodrell Bank, at Manchester, England. Although it is recognized that the latter is of a preferred type, the

Korolkov instrument nevertheless remains an interesting experiment.

N. F. Kuprevich, of the Pulkovo staff, is working with television-type systems. His laboratory was not included in the general tour, but a few of us asked to see it. The principle of the experiment is to use the telescope as a television camera to produce an image on the picture tube, just as is done in a telecast.

His equipment consists of a small telescope rather precariously set up on the balcony of the small room that serves as his laboratory. One television receiver stands by the telescope to help the observer adjust the image. A second receiver, for visual inspection of image quality, is on a table inside the room. A third —and smaller—receiver stands next to it, facing a photographic camera, for permanent recording of the images.

No research program has been initiated yet in this field. Kuprevich is still exploring the possibilities of his instrument. He showed us some excellent pictures of the lunar surface. One picture, in particular, revealed extremely fine details. His pictures of stars and planets still leave much to be desired, but on the whole his experiment seems to hold promise.

In the month of December, the New Moon will occur on December 10, and the moon will be full on December 26. The winter solstice, marking the beginning of winter in the northern hemisphere, will occur on December 22 at 3:40 a.m., Eastern Standard Time.

Mercury will be too close to the sun in the early part of December. It will enter the morning sky on December 9, and will reach its greatest western elongation on December 29. By the end of that month, it will rise one and one-half hours before the sun, and may be seen as a morning star, low in the southeastern sky just before sunrise.

Venus will set shortly after sunset during the whole month of December. It will remain close to the sun, but by the end of the year it may be seen as an evening star low over the southwestern horizon.

Mars, in Aries, will be up in the east at sunset, and will set at about 5:30 a.m. on December 1, 4:30 a.m. on December 15, 3:15 a.m. on December 31. Now receding from the earth, it is fading in brightness, but is still conspicuous high in the southern sky by late evening.

Jupiter, in Libra, will rise at 5 a.m. on December 1, 4:30 a.m. on December 15, 4 a.m. on December 31. By the middle of December it will be found in the southeast just before sunrise.

Saturn, in Sagittarius, is lost in the evening twilight and too close to the sun for observation. It will enter the morning sky on Dec. 20.

The Geminid meteor shower is expected on December 13, with a maximum zenith rate of forty per hour. The absence of moonlight will favor observations.

Air Zoning

Air zoning, in addition to land zoning, may be essential for American cities in the future, says Dr. Francois N. Frenkiel, of the Applied Physics Laboratory of Johns Hopkins University, in a report recently published by the Smithsonian Institution, Washington 25, D. C. Air pollution from factory smokestacks, automobile exhausts, smoke from fires and chimneys, and other sources, Dr. Frenkiel points out, each year is causing the deaths of a large but undetermined number of persons. It is estimated, for example, that at least 4000 died in London during the intense "smog" of the winter of 1952, although this particular case was closely associated with peculiar local meteorological conditions and perhaps never will be duplicated. There can be little question, however, that the air pollution problem for large cities is becoming more serious, says Dr. Frenkiel, and much can be done to modify conditions. The only ultimate answer, he believes, is "air zoning" applied to both city extensions and clearance projects.

Instructional Materials

Ready for distribution now is the Jam Handy Organization's 1958-59 catalog of classroom instructional material, a quick reference list of filmstrips that are coordinated with curriculum. More than 700 class-tested filmstrips in 15 curriculum areas are listed here, indexed by grade level and subject areas, and consisting of on-the-scene photography in color, art work in color, or combinations of these. This 22-page catalog is available on request from the Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan.

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Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

Lend Me Your Ears

SOME TWO THOUSAND years ago Marcus Antonius is reputed to have exclaimed, from a spot where I recently stood: "Friends, Romans, countrymen. Lend me your ears." Having just returned from the centers of the Greek and the Roman empires, I cannot help but feel that he should have referred not to his countrymen but to his country men. So far as I could see, the urban centers of the Mediterranean have bled the rural sections dry, and the politicians of Caesar's time borrowed not only the ears on the heads of their countrymen but the ears of grain raised by the country men. And they have made little return on the loan. In Rome and in Athens, prosperity seemed to be the lot of most folks, while in the back country this was not true. In Athens, the cars were big and the beasts of burden small. In Rome, the cars were small and the beasts of burden large. But in the back country of both, much of the work was performed by the women and the children.

In the little town of Metsovo in Greece, I saw two husky men loading four-foot logs on the back of a little old woman who would not have stood much more than four feet tall had she stood erect. Then, they added a few more sticks and sent her on her way. At the insistence of our guides, my two bags were taken by an eight-year-old boy and carried two blocks, while husky men stood about and did nothing. A hundred feet away I saw a teenage girl dressed in widow's black carrying a huge urn of water as she slouched down hill almost barefoot. She would have been a beautiful woman, but the expression on her face indicated the most hopeless despair I ever want to see. In the town was a fine museum reached only by a cobbled, steep path crowded with cows, children, kids and chickens and some of their by-products.

I.U.C.N. meeting

We were on this trip primarily for the purpose of attending the meeting of the International Union for the Conservation of Nature and Natural Resources. And yet I saw a north-European delegate stoop down and cut off with a knife the first wild, uncultivated crocus I had ever seen, and later dig up a whole clump of the beauties. These experiences try one's soul. But the one thing that stood out was the obvious result to be expected from uncontrolled grazing by sheep and goats on steep lands sparsely covered with soil. Wherever the soil was given protection, it seemed to yield returns that were surprisingly rich. I came away convinced that, under reasonably intelligent management, there was nothing about the topography, the soil and the climate that would prevent good returns. Without such management, there was nothing that could bring happiness to the people. Basically, the people were kindly, wholesome folks but the odds against them economically were simply staggering. The hinterland had loaned its ears and its wealth to the politically controlled urban centers and had gotten little in return.

I was also impressed by the phenomenal buildings created by ancient Mediterranean people without the help of our modern machines, and the absurdity of looking to the past rather than to the future for satisfaction. Not a plant, an animal or a geologic formation was pointed out to us unless it was associated with war or with religion in the past. At the end of the first day a gentleman from northern Europe rebelled against the program and insisted that we stop to photograph spectacular things. At the end of the fourth day, a gentleman who lived to the south expressed the hope that he would "never again have to see another.....church."

Meeting worth while

But this is all impressions. The meetings we attended were definitely worth while and we are glad that we went. I particularly enjoyed seeing the reforestation that had been done about Athens, and elsewhere, by the Boy Scouts. I enjoyed seeing the fine buildings being erected in and near Athens and Rome, where the daily wage of workmen, I understand, approximates the hourly wage of their American counterparts. I would like to predict that the brick and tile structures being built today in suburban Athens will outlast America's cardboard suburbia, just as America's intelligent husbandry of our rural natural resources will outlast what seems to me to be unintelligent management of rural Greece's natural resources. So far as wildlife is concerned, I am sure that on any road running five miles from my home I can find more than ten times the number of wild animals killed by cars than I saw in more than 500 miles of travel over the roads of Greece. Somehow we have managed to produce wildlife for the kill in spite of, or because of, our intense agricultural procedures. Some of our party had come along roads behind the "iron curtain," and were greatly pleased with the roads of Greece. They had been advised that the roads in Jugoslavia were largely macadam. They were convinced that the use of the past tense was correct, and that the pronunciation given as "mac a dam" was entirely appropriate.

Of course, like all tourists, we had our difficulties with money exchange. It may be significant that Switzerland was the only one of five European countries visited during the summer where officials charged with exchanging our money did not apparently try to take advantage of our suspected ignorance. We had of course been warned about what we should eat and drink, and religiously followed what we thought was a safe regimen. Everything went perfectly until my wife succumbed to the sight of lettuce and tomatoes on the plane leaving Rome. For a week after our return, she has been paying the price.

Action taken

But let us get back to business. I think that the meetings of the International Union for the Conserva-

tion of Nature and Natural Resources are thoroughly worth while on the whole. Seven American organizations were admitted to membership at this recent meeting. Encouraging resolutions were passed relative to saving threatened species of Nature in the Mediterranean and Madagascar regions. Due consideration was given the problems created by dams in arid areas, to the problems of coordinating the work of national parks and reserves, and in particular to matters dealing with the control of predatory birds. Definite disapproval of blacklisting of species and of the paying of bounties was obvious. Generous encouragement was given to the work in conservation education but it was obvious that nations that had made little progress in this field had little appreciation of what had been and was being done elsewhere in conservation. A reading of the printed report will supply adequate specific evidence in this matter.

Of course, as always in these conventions, possibly the greatest rewards come through association with people of highly varied backgrounds. Provincialism vanishes after the first day or so, and, in spite of language and experience hazards, you find yourself somehow yielding to the spirit of the occasion and wanting to do better than your best to advance a philosophy that you know is sound, unselfish and right. You may come with pride in your background, but you become humble in the recognition of your inability to communicate your convictions effectively to those who speak other languages. Caesar found that while he might conquer the world by warlike means he was not without serious opposition close at hand. We may feel that the world at large does not recognize our conviction that our techniques of living offer superior rewards over a sustained period. It may not be so. We might be partly wrong.

To meet in Warsaw

The next meeting of the I.U.C.N.R., in 1960, will be held in Warsaw. I should like to attend but I doubt if I do. I already have two important engagements for the same time here in America. I really wonder if I could bridge the gap caused by the Iron Curtain and either profit by the experience myself or help others by my attendance. Still, it would be worth while trying and I am satisfied that under I.U.C.N.R. leadership, represented to a large extent by Mme. Marguerite Caram, something might result of value to me at least.

It is great to get back to our modern American civilization and look more to the future than to the past, to drink water from the tap and to eat lettuce and tomatoes without fear of consequences. Immediately on my return, I sent off 252 exposures of color film for processing by one of our most efficient modern camera centers. I did not dare do this in Europe for fear of inferior service and the loss of my prized pictures. In the midst of writing this report, I received a long distance call saying that the processing firm was sorry but they had used the wrong developer and all of my pictures were spoiled. They regretted the mistake and could only suggest that I take the trip again next year.

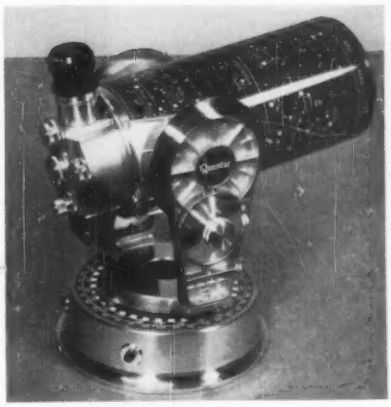
Right here let me paraphrase Marcus Antonius and say, Friends, Romans and City men. Lend me your ears. When I get back from that imaginary trip, I will tell you all about it. As for the immediate present and future, it is probably best that I remain completely speechless.

Science Bibliography

An excellent bibliography entitled "Selected Science Books for Secondary Schools" has been compiled by the Connecticut Science Teachers Association. It is designed as a guide to both teachers and librarians, and each listing includes brief estimates of the books and summary of their contents. Copies are available from R. Vincent Cash, Teachers College of Connecticut, New Britain, Connecticut, at twenty-five cents.

Teaching Aids

Pointing out that America must do a much better forestry job on her timberlands if they are to supply the wood needs of the possible 300 million citizens of the year 2000, the United States Forest Service has recently released a set of thirteen new conservation teaching aids summarizing the important aspects of today's timber situation. A single set of these aids, illustrated with charts, may be obtained by the teacher on application to the Forest Service, Washington 25, D. C., or from the nearest regional Forest Service offices.



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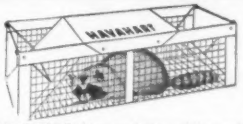

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THE Nature CAMERA

By EDNA HOFFMAN EVANS

The March Of Progress

BECAUSE CHRISTMAS IS IN THE AIR, I wandered into a toy store just the other day. It was not of the dime-store variety, but a real, sure-enough, big establishment devoted exclusively to the sale of toys for the current generation of small fry. I had a wonderful time, and as I looked over some of the items I could not help feeling that I had missed something by being "born thirty years too soon." I would have liked to play with them myself.

But as I browsed and admired, I also wondered whether modern children were not missing something by having so much—so many toys to choose from. There is so little left to the imagination these days. A kid can have (straight from the store) an atomic energy set, a space helmet, King Arthur's sword, Zorro's cape, a complete wardrobe—all accessories included—for a sophisticated looking doll, a stage coach, a make-it-yourself dinosaur skeleton, or a toy veterinarian's establishment that includes an operating table, a bath tub, and a whole room full of caged patients.

My generation was certainly not hard-up for toys, but some of the things we played with we concocted or whittled out for ourselves. We had a lot of fun imagining, and we cherished and loved our toys much longer than the current crop of toy-consumers seems to.

A wealth of gadgets

Much the same feeling prevails when I look at the numerous gadgets and accessories available to the modern photographer. He, too, has many things to choose from. They are things that are nice to have, and they help greatly on some specific occasions. But I suppose he could get along without most of them if he had to.

This feeling may not be exclusively mine. I read recently about one camera-club-sponsored outing that put a limit on the equipment that could be used by participants. Shutter speeds were limited to from 1/25 to 1/300 or bulb, and the largest lens opening permitted was f/3.5. Rangefinders, ground-glass viewers, exposure meters, and flash all were forbidden. The only accessories allowed were tripods, cable releases, and filters (one per camera). Such limitations put the Leica and the Kodak Pony users on an equal footing.

Thus, as I look over the equipment available as photographic Christmas gifts this year, I wonder which will be useful to the hobby photographer, and which will turn out to be just some more gadgets.

There are some basic items of equipment that every photographer should have. Included among these are: one camera, a case to protect it and to carry it in, a lens shade, and, perhaps, since so many camera kits come with them these days, a flash attachment. For more elaborate equipment I would add: a tripod, a set of filters, an exposure meter, and an auxiliary lens of some sort.

From there, the field is wide open. We may add to our cameras, we may go into darkroom equipment, we may become interested in close-ups, telephoto lenses, remote control devices, electronics—and the equipment quickly mounts up, as well as the prices.

There seem to be two trends in the air this year. One trend, already in use in the movie field and soon to make itself felt in "still" photography, is the built-in accessory. An electric eye built into the camera eliminates the need for auxiliaries like exposure meters, and built-in rangefinders perform a similar service in focusing. These automatically adjust the camera lens to suit the prevailing circumstances. In fact, they almost make the dream of "no gadgets to use and only one button to punch" come true.

More skill needed

At the other end of the situation are to be found some elaborate devices that make photography a pursuit requiring more specialized equipment and technical skill than ever.

One example of this is the increased use of tape recorders with slides. No longer does the lecturer have to be there in person. His talk is taped and, together with his slides, can be mailed almost anywhere. At the receiving end, a projector operator need not even sit close to the projector in order to change slides at the right time. Various remote control devices allow him to sit across the room from the projector, in

"Umm-good" is the title of this picture, taken by Richard Prasil and entered in last year's Chicago International Nature Photography exhibition. Deadline for entries in the coming exhibition is January 17. Do not delay in obtaining entry blanks from Wendell Dahlberg, 1121 W. 93rd Street, Chicago 20, Illinois.

This is the complete Praktina FX radio control unit, including transmitter and receiver, camera, and electric motor used to advance the film by remote control. To this may be added the 50-foot bulk-film magazine to "make a Nature photographer's dream come true."

whatever comfortable position he chooses.

The room need not be darkened for movies, be they home-made or commercial. By means of a daylight motion picture projector, available from Triangle Projectors, Inc., 3706 Oakton Street, Skokie, Ill., pictures can be shown in a lighted room. The device for this is literally a "little theater in a suitcase" that uses rear-projection on a daylight screen equivalent in size to a 21-inch TV picture. While it may not have too many home-movie possibilities, the outfit is readily adaptable to many educational, scientific, and commercial situations.

Also new in the 16mm viewing field is the Craig 4x6 viewer built by the Kalart Company of Plainville, Conn. This viewer permits a much more comfortable viewing of films, either for editing, or for small groups where the use of a regular projector and screen would be impractical. Sharpness of image is assured by means of a 3-element f/2.8 projection lens, condenser lens, and 4-sided rotating prism. Illumination is provided by a 75-watt lamp. The device is priced at $89.50. Incidentally, the Kalart Company, long a producer of flash equipment for cameras, has expanded greatly into the audio-visual field; a card or letter of inquiry to them will bring a great deal of useful audio-visual information and literature.

While Kalart has discontinued its manufacture of flash equipment, its list of precision photographic equipment now includes items like editor-viewers, splicers, splicer-rewinders, and a combination projector and record player that provides another "wrinkle" in the methods of making pictures talk.

Devices for camera

In the field of what I would call "the answer to a Nature photographer's dream" are two devices marketed by the Standard Camera Corporation, 319 Fifth Avenue, New York 16, N. Y. The company, first of all, distributes the Praktica and the Praktina, both 35mm single-lens reflex cameras. The latter is slightly more expensive, and both cameras are available at different prices, depending on lens and other built-in devices. Base price of the Praktica with a 50mm f/2.8 C.Z. Jena Tessar lens with internal automatic diaphragm control is $179.50, and base for the Praktina with the same lens and diaphragm control, plus waist level finder and ground-glass, is $199.50.

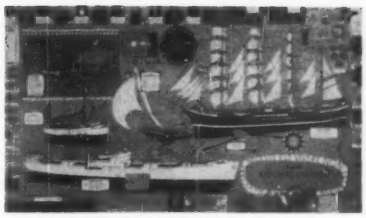
It is the Praktina FX camera for which the "dream" features are adapted. The first of these is a radio control unit that makes it possible for the photographer to operate the camera automatically at distances of up to a mile or more. The operation is in the camera itself, with no external wiring needed.

In operation, the receiver component of the control unit is plugged into the electric motor attached to the camera. The transmitter component then may be used at any distance up to a mile or more from

This shows the 50-foot capacity bulk-film magazine attached to the Praktina FX camera. By means of this magazine, the photographer can make 420 exposures without reloading.

the camera to close a relay circuit that activates the electric motor to operate the camera. A sequence of operations takes place in which the shutter is released to take the picture, the film is transported to the next frame, and the shutter wound for the next exposure.

The second device may be used in conjunction with this first one. It is a 50-foot capacity bulk-film maga-



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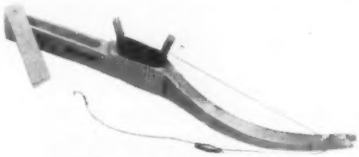

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zine that can be attached to the camera. By means of this, 420 24x35mm exposures are possible on a 50-foot roll of film. No change of film in the magazine will be necessary until all 420 exposures have been made.

Every time the photographer presses the transmitter button, he will take a picture. He can take individual pictures at selected intervals, he can take sequence photographs by pressing and releasing the transmitter button repeatedly, or he may use an automatic timing device. Use is not restricted to one camera. The radio control device may be set up to operate as many cameras as the photographer wishes from the same transmitter. Or, by using matched transmitters and receivers, the photographer can operate a battery of cameras, each from its own transmitter.

Just picture this "answer to a Nature photographer's dream," as it is described by the Standard Camera Corporation's publicity writer: "The Nature photographer will be able to set up his equipment for battery operation near an animal watering-hole or overlooking a bird's nest. From a vantage point a mile away, he will be able to follow animal action through a pair of binoculars while activating his Praktina FX camera with the radio control unit. The animals will not be frightened off by human scent or in any way distracted from their normal behavior patterns. The resulting photographs will be excellent examples of animal life which can be used for illustration in magazines and books. Naturalists are expected to be heavy users of this equipment."

The grand total

It sounds wonderful. Let us see—how much would a gift like that cost old Santa Claus? The base camera (the Praktina FX model has a 58mm C.Z. Biotar f/2.0 lens) costs $297.50. List price for the radio control unit, including transmitter and receiver (less batteries) is about $100. Add to that the sum of $150 for the electric motor and $69.50 for the 50-foot bulk film magazine. Total it up and we find that this gift will cost Santa the grand sum of $617.00. That is not too bad, when we consider how much automobiles, TV sets, air conditioning units, and mink coats cost.

I do not expect Santa to leave such equipment under my tree this Christmas. I am afraid that I would wear myself out trying to learn to use it. More than that, I would flatten my pocketbook trying to get to places where it could be used to the fullest extent. I think I would rather squeeze a bulb at the end of a 30-foot rubber tube than punch a transmitter button a mile away from my picture. I would rather read my meter and make my own calculations (and make errors, as like as not) than have an electric eye to do all my figuring for me.

As in the contrast between toys of yesteryear and those of today, I prefer to "do it myself," and to scrounge for materials and figure out how to put them together, instead of taking them ready-made out of a box with full instructions included.

I will keep my bulging gadget bag, add a few more or less useful items, and thank Santa for whatever he chooses to leave—as long as it does not require an electronics wizard or a mechanical brain to figure out the operations.

But, reader, if you are the kind who likes the complicated devices—may Santa bring you all of them, and a very Merry Christmas, as well!

New Look

(Continued from page 516)

associated with museum planning, has influenced the design of all the new halls. They have been laid out so that television cameras can easily move through the exhibit alcoves. Museum officials believe that some day home viewers can take regular museum tours, just as they now go to the theater, opera or ball game, by way of their home TV sets.

Although safecrackers may be the exceptions, nearly everyone else, including both scientists and the public, has unanimously approved the changes being made in the "National Attic." Many of the visitors to the new halls seem to have the same reaction as does a reader when he finishes a particularly moving or exciting story. "Time and again people have told me, 'I wish there was more,' " says Dr. Friedmann, who has been closely associated with the entire remodeling program. "When that is said about a museum with 45,000,000 items in its collections, I consider it quite a compliment for the story-telling ability of our exhibits people."

Coot

(Continued from page 522)

coots to get on admirably with other water birds.

Webster says that coots fly slowly, and can hardly be classed as game birds. Ornithologists agree. Arthur Cleveland Bent thinks that their flesh is not highly regarded, but he points out that they are clean feeders and are quite palatable. Alexander Sprunt, Jr., a specialist on southeastern bird life, maintains that even a professional can not always tell the difference between good mallard and choice coot, and declares that coot flesh is excellent.

In a civilized world of rapid-fire living, with problems about this and worries about that, one relaxing and absorbing pastime is to contemplate a pondful of lackadaisical coots that never seem to worry about anything. Gay, assertive, and entertaining, no other bird surpasses in fun the happy-go-lucky American coot.

Whooping Crane Movie

The United States Fish and Wildlife Service has released a new film, in sound and color, of the family life of the whooping crane and the efforts that are being made to save it from extinction. The movie, which is in 16mm and has a running time of 14 minutes, shows the birds in flight, landing and taking off, selecting territory, searching for food, and exercising and resting; it ranges in locale from the Aransas National Wildlife Refuge in Texas to the nesting grounds in the Canadian Northwest. Persons or organization desiring the loan of the film, entitled "The Whooping Crane," should write the U. S. Fish and Wildlife Service, Washington 25, D. C., for information about booking dates.

Takes up Duties

On July 15, Dr. William C. Steere, professor of biology at Stanford University, and since 1955 dean of Stanford's graduate division, assumed the directorship of The New York Botanical Garden at Bronx Park in New York City. Dr. Steere, a noted specialist in the study of the bryophytes—the mosses and liverworts—has had a long career in botany, is chairman of the committee of the Botanical Society of America, a prolific contributor to scientific literature, and a member of many scientific organizations.

Nature IN ROCK AND MINERAL

By PAUL MASON TILDEN

Relics Of The Cold

FOR MOST OF THE COUNTRY, THE MONTH of December sees winter well under way, so that it might be an appropriate time to mention a rather interesting news story that appeared not long ago. According to the story, there is at least one scientist who is convinced that another glacial stage may be close at hand, and that within a hundred years, give or take a few, the continental ice sheet will begin another advance.

On the other hand, there have been a number of stories in the recent past pointing out a slow but steady warming trend on the earth's surface because of the so-called "greenhouse" effect of the atmosphere's increasing carbon dioxide content. Your choice between these two hypotheses will depend largely on how you like your climate—hot or cold—but, in any case, there will probably be ample time in which to consider the matter.

There was nothing hypothetical, however, about the advance and retreat of the last, or Wisconsin ice. Among the many tangibles and intangibles left by the retreating ice sheet were two that will be mentioned here, one of each in the above categories.

Souvenirs of the ice

In the great assortment of rock debris that was carried along by the ice and deposited at random over much of Canada and the northern third of the United States, there is ample material for collectors who are not devoted entirely to the mineralogical aspects of their hobby. Road cuts and gravel banks in glacial kames, eskers, and moraines fairly teem with glacially cut, scratched or polished specimens, and the collector has the opportunity to pick and choose anything from pebbles to boulders, according to available space.

In addition to leaving items for collectors, the continental ice sheet left some scars on scientific sensibilities that were fully as deep as those engraved on the bedrocks of abraded countries. During the nineteenth century there was bitter controversy over the proper explanation of the grooves, furrows and scratches that were made by the rock debris frozen into the bottom of the moving ice.

This glacially cut and polished stone from New England exhibits many tiny scratches running in various directions over the smooth sides. The wedge-like form is a common one in unsorted glacial debris.

Many reputable geologists were of the opinion that these marks, or *striae*, represented the drag-marks of icebergs during the Biblical deluge. Others credited the striae and the drift material to great outrushes of water from the polar regions, although it was never wholly explained where such prodigious volumes of water originated, or where they finally went. (*con't. on page 552*)

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EARTH SCIENCE, Rockhounds National Magazine. Subscription $2.00. Sample 35c. Box 1357-N, Chicago 90, Illinois.

It was well past the middle of the past century before the continental glaciation theories of investigators like Hutton, Charpentier, Geikie and Agassiz became firmly established among geologists. This is what one eminent New England geologist, C. R. Jackson, said in 1844 during a discussion of the problem.

"Following this tranquil period (the late Cenozoic) came one of great turbulence, the ocean waters and seas of ice from the polar regions having been hurled with violence over the surface of the northern hemisphere, breaking up and transporting masses of rocks, and driving the loose materials to the southward and depositing them, not unfrequently a hundred miles distant from their parent beds."

Of Louis Agassiz's continental glaciation theory, Dr. Jackson had this to say: "We may examine the state of things in this country, and discover in a short time that the glacial theory of drift is absurd." And, in the opinion of the Swiss geologist de Luc, "this dazzling system has led many distinguished men into error."

In the end, the continental glaciation theory prevailed, and the last scientific defender of the outrush-of-waters school of thought, Sir Henry Howorth of England, passed on in 1905. We may smile a bit at some of the older explanations of glacial phenomena, but we should remember the old saying that there is nothing as obvious as the truth—once it has been shown to us.

Early Primates

Some thirty-nine genera of primates are known from the various early Tertiary rocks of the Rocky Mountain region of the United States, according to Dr. C. Lewis Gazin, curator of vertebrate paleontology at the Smithsonian Institution in Washington, D. C. The primates, general group of mammals that includes man and the lemurs, tarsiers, baboons, monkeys, and apes, flourished in North America from at least 70 million to about 40 million years ago, says Dr. Gazin, pointing out that the heyday for these mammals was in the middle Eocene period, when a semi-tropical and well-forested environment caused them to attain their full significance in the fauna of the times.

African Bird Record

Recently released by Cornell University Records, a division of Cornell University Press, is a 33-1/3 rpm recording entitled "Voices of African Birds." "Few places in the world can rival East Africa for birds," says Myles E. W. North, senior district commissioner for Kenya and recorder of the songs of this disc. Mr. North's primary aim has been to produce an interesting, representative, and entertaining selection of the voices of the commoner African species, of which 42 are included. Description includes both English and Latin names, locality heard, and the month in which the recording was made. The price is $7.75, and Cornell University Records, 124 Roberts Place, Ithaca, New York, will send more information about this and other recordings of wildlife voices on request.

In the Market

All the Christmas shopping you were going to do in the summer and fall must now really be done, so this month we are listing a few suggestions for all ages.

For youngsters of 6 years and up, Halsam Products Company, of 3610 Touhy Ave., Chicago 45, Illinois, has construction sets of "Early Settler Logs" that tongue-and-groove together to make some of the nicest backwoods cabins and frontier villages we have seen. (It is fortunate the manufacturer added "and up;" it permits us to add, unabashedly, that we tried a set, too). The logs are free of splinters, realistically colored, and come in 4 different sets priced from three to ten dollars. . . For people making plans for next year's camping trip, Morsan Tents, of 10-27 50th Ave., Long Island City 1, New York, offers a new idea in tenting—a 2-room tent called "The Homestead." The larger rear room is for sleeping, and the front room for dining; all windows are insect-proof, seams double stitched, and all hardware and rope furnished . . .If there are fishermen in your family, Fred Arbogast, the lure-maker at 313 W. North Street, Akron 3, Ohio, has a new bass lure called "Hum-Bug," in three weights, that produce a special sound said to be most attractive to bass; the company will send more details about this and other lures it makes. . . Edmund Scientific Co., of Barrington, N. J., has recently developed for the space era a special camera for taking pictures, through telescopes, of the moon and stars. (It may be used also for terrestrial telephoto work.) With attachments and filter, this sturdily-built camera sells for $39.50, and Edmund will be glad to send information. . .Another item for next year's camper is a compact aluminum case that converts into a camper's tent, complete with table, chairs, cots, stove with bottled gas, and a kitchen sink with running water. The lightweight combination will easily ride on a car top, and is introduced by Sky Camp, Inc., of 9237 Long Beach Blvd., South Gate, Cal., who will send more information on request.

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Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

African Sleeping Sickness

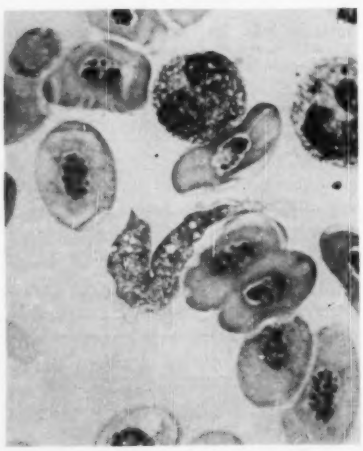
2. The Parasites

(Photomicrographs from slides courtesy Ward's Natural Science Establishment.)

THE GREAT scourge of equatorial Africa is caused by microscopic organisms that dwell in the blood, just as does the malarial parasite. They belong to the genus *Trypanosoma*, the first examples of which were discovered in 1841, and named by Gruby in 1843 from a type found in frogs. All vertebrate classes are attacked, and in all known cases save one the infection is transmitted by blood-sucking invertebrates—usually insects but in some instances leeches.

The beginner in this work can do no better than to make the acquaintance of trypanosomes by preparing a blood smear of the common newt, which harbors a typical example, *Trypanosoma diemyctyli*, a large species, long and slender, with a prominent undulating membrane. Many kinds of frogs contain *T. rotatorium*, typically a large and broad form without a freely projecting flagellum, but varying considerably and showing some examples that are slender with a long flagellum. These parasites collect in the viscera, notably the kidney. In making a slide preparation, kill a frog with ether, dissect it and remove a kidney; slice this organ so as to obtain a blood smear, discarding the solid tissues. Observe the living trypans (common English abbreviation for the longer name), then make a permanent mount stained with Wright's or Giemsa, as for an ordinary blood smear.

Trypanosoma rotatorium in frog blood 1200X.

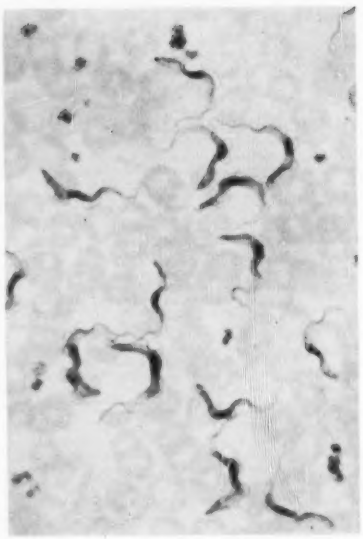


For a characteristic mammalian species of parasite, nothing is better than the one found in the rat as a non-pathogenic invader, *T. lewisi*. From supply houses you can buy a live infected rat, study the living trypans, and prepare as many slides as wished; this type is perfectly harmless. Stained slides also may be purchased, as is true for those others, soon to be described, that are highly pathogenic for man. In order to understand trypan morphology it is essential to consider the relatives of this genus and the ways in which they have evolved.

Basis for subdivision

To begin with the largest taxonomic group, the phylum Protozoa is subdivided on a basis of the structures that perform locomotion, and those that have a long whip-like or thread like protrusion from the cell body, the flagellum (L., little whip), are commonly termed *flagellates* and are placed in the Class Mastigophora (Gk., whip-bearer). Many flagellates have chlorophyll and perform photosynthesis, as do plants, and so these are grouped as the sub-class Phytomastigina, whereas the animal-like species, without chlorophyll-bearing bodies, comprise the Zoomastigina. Six orders of the first and four of the second are recognized. Among these last is the order Protomonadina, whose species eat organic food, as does any animal, or are parasitic; in which there are one or two flagellae; and which commonly reproduce by fission, sexual reproduction being unknown. Nine families are included.

Members of the family Trypanosomidae are exclusively parasitic, and those occurring in the blood of vertebrates comprise the group called hemoflagellates. The cell body is flat or leaf-like and commonly elongate, highly flexible, the animals swimming with undulations or wriggling like microscopic eels. There is a small, spherical, central nucleus, usually appearing more or less empty (vesicular type) save for a dense, dark-staining, central endosome. Located at different situations in the cell is a group of structures, the *parabasal apparatus*, concerning which there is not yet agreement as to terminology or function, centered around the point of origin of the flagellum. This little whip springs from a granule, the *blepharoplast* of some authors; others call it the *basal granule* and represent a second, adjoining granule as the blepharoplast. Those of the first school call the second granule the *parabasal body* or *kinetoplast*.



Trypanosoma gambiense in human blood, 1000X.

The flagellum itself may take off from the anterior end of the cell or from a point just anterior to the nucleus or from far back in the rear. In the last two cases it becomes marginal and is supported by two very thin extensions of the pellicle that protrude outward to make an *undulating membrane*, supporting the flagellum at its outer margin. When waves of motion pass along the flagellum, the membrane undulates, propelling the animal rapidly. The flagellum may extend for a considerable distance forward from the anterior end of the cell as a free portion (see illustration of *T. gambiense*), or may not protrude at all (see illustration of *T. rotatorium*).

Trypanosoma lewisi in rat blood, 1500X.

Members are polymorphic

Members of this family are polymorphic, meaning that there are changes in structure during the life cycle of the cell. Four cell types occur and, according to the appearance of these in the life cycle, six genera are recognized. Strange as it may seem, in order to understand *Trypanosoma* adequately, it is not sufficient to study this genus alone, with its many species, but one must know the other three cell types too.

Most primitive is the *leptomonad* form (see illustration), the cell body being elongate or sometimes pear-shaped, nucleus central, flagellum arising from a basal granule near the anterior end, kinetoplast so close to the granule as to be distinguished with difficulty, and no undulating membrane.

Next comes the *crithidial* form, elongate, nucleus somewhat more posterior, the flagellum springing from a basal granule which has shifted back to a position just anterior to the nucleus, kinetoplast large and prominent, flagellum connected to cell body by an undulating membrane occupying the anterior half of the animal.

A third type is the *trypanosomal* form, also elongate, the nucleus more or less central, the basal granule shifted far to the rear, behind the nucleus, the kinetoplast now somewhat farther from the granule, and the flagellum supported by an undulating membrane that now occupies most of the length of the cell.

A final type is the *leishmanial* form, which is small and round, with an eccentric nucleus, a basal granule nearby, from which arises a structure usually termed the axoneme or rhizoplast that is actually the vestigial remains of a flagellum, running to the cell margin but not protruding beyond, kinetoplast round or rod-shaped, no undulating membrane. This type must be considered as having degenerated from a stage between the leptomonad and crithidial.

These forms are named from the principal genera that exhibit them and which display a remarkable example of recapitulation in evolutionary sequence. The genus *Leptomonas* occurs in the hindgut of insects and possibly in other invertebrates, an example being *L. ctenocephali*, from the dog flea. The form is leptomonad and these produce leishmanial individuals that are voided in the feces and ingested by flea larvae to continue the infestation. No vertebrates are involved and it is certain that the whole family arose primarily as insect intestinal parasites.

Occurs on plants

The genus *Phytomonas* occurs mainly in plants, notably in euphorbias and milkweeds, transmission being via latex-sucking bugs, as *Stenocephalus*. Leptomonad and leishmanial forms are found in the plant, causing wilting; leishmanial forms multiply in the insect and produce leptomonad forms in the salivary glands, these being infective for plants. These protozoans would probably be considered as species of *Leptomonas* were it not for their peculiar life cycles, involving plants. But as direct transmittal from one insect to another of leishmanial forms has been observed, it may be that the genus *Phytomonas* will be eliminated in the future.

In *Crithidia*, confined to invertebrates, there are leptomonad, leishmanial, and crithidial forms in the cycle. *C. gerridis* in the water-strider and *C. fasciculata* from the mosquito *Anopheles*, are examples. Transmission is by passing of leishmanial forms that are ingested by new hosts, as in *Leptomonas*.

Herpetomonas is also limited to invertebrates, occurring in the gut. It differs from the foregoing genera in that its life cycle includes leptomonad, leishmanial, crithidial, and trypanosomal forms—all four stages. Best known example is *H. muscarum*, from the house fly and related species. Leishmanial forms are voided in the

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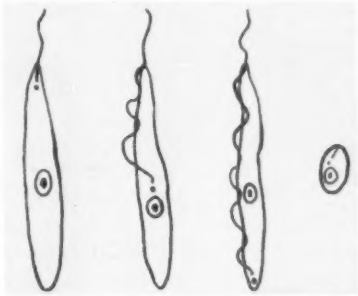
dejecta and picked up by new hosts, as in *Leptomonas*.

All of the foregoing genera are parasites of the digestive system of insects and sometimes other invertebrates. We come now to the final two, which involve not only the insect gut but also the blood system of vertebrates. *Leishmania* exists in leptomonad and leishmanial forms, commonly with the former in insect digestive tracts and the latter in vertebrate tissues. One species, *L. chamaeleonis*, from the African chameleon, occurs in the leptomonad form in the lizard's gut, but the usual situation is that represented by the several human parasites, dangerous pathogens indeed.

An example is *L. donovani*, causal organism of kala azar, a highly fatal disease that is all too common in China, India, and portions of Africa and South America. The vector is



Left to right, leptomonad, crithidial, trypanosomal and leishmanial forms.

the sandfly, *Phlebotomus*, which houses the leptomonad forms. These multiply in the insect and pass into the foregut, whence they are inoculated into the blood of man when the minute fly bites his victim. In the new host the parasites are ingested by macrophage cells, the policemen of the body, found mainly in the spleen, liver, bone marrow and lymph glands. Instead of being destroyed by these cells, as is usually the case, the parasites thrive and multiply, as leishmanial forms, and remain exclusively intracellular in their vertebrate host. Some re-enter the blood by being ingested by monocytes and neutrophils, and it

is these that can be sucked up by another sandfly to complete the cycle from insect to man to insect.

The highest genus

The sixth, last, and highest genus in this complex family is the subject of this series, *Trypanosoma*. There are hundreds of known species, infesting every sort of vertebrate host and transmitted as a rule by biting flies or leeches. Life cycles vary considerably. In *T. lewisi*, nonpathogenic parasite of the rat, trypanosomal forms occur in the blood plasma and are sucked up by a rat flea, where they enter the epithelial cells lining the stomach. Here they round up and multiply and eventually pass to the rectum, attaching themselves to the lining by their flagellae. In succession they become crithidial, leptomonad, and leishmanial forms. Then these last again become leptomonad and then change to a short, telescoped trypanosomal form termed *metacyclic trypanosomes*, which then pass out of the flea with its feces. This cycle occupies about six days. When the flea bites another rat it takes a blood meal and voids feces, at a location alongside the wound. The rat scratches and commonly rubs some of this infective material into the puncture. Only the metacyclic trypans can start a new cycle in a rat. The infection will last for several weeks, but meanwhile the host forms a reproduction-inhibiting antibody which soon prevents multiplication of the parasite. In a period varying from one week to several months the rat thus gets rid of all its trypans and thereafter is immune to further attacks. This, of course, shows that the rat has been exposed to invasion by this trypan for a long time and has responded by an appropriate protective mechanism. Unfortunately, this is not the case with those species that parasitize man, a relatively new host.

Not all trypans go though all of the stages. In *T. gambiense*, the human pathogen of Gambian sleeping sickness of West Africa, transmission is by a tsetse fly, *Glossina palpalis* and in certain regions by another species *G. tachinoides*. A high temperature favors development of the parasite in the fly, but even so only a small percentage of them become infected. What would have happened in Africa had all of the flies that were exposed to infection become hosts to this trypan beggars description, for even with this low incidence in the fly population, the disease has broken out in epidemics that caused fearful human mortality.

Protozoans multiply

For some two weeks the protozoans multiply in the fly's gut and by the end of the third week are found in the salivary glands. Here they go through a crithidial stage, multiply further, and finally become metacyclic trypanosomes, the cycle lasting from three to five weeks, the end forms being infective for vertebrate hosts. It has also been established that mechanical transfer

(*Continued on page 560*)

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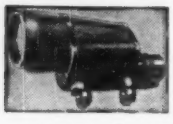

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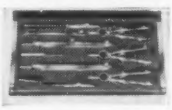

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Microscope

(*Continued from page 556*)

of the trypans by the fly passing from one victim to another within a day or so, while some flagellates are still present in the mouthparts, is possible. After this time, only metacyclic transfer can be made.

Rhodesian sleeping sickness is caused by *T. rhodesiense*, transmitted by *Glossina morsitans*, and occurring in East Africa, overlapping the other form of the disease in places. The Rhodesian type is more virulent and thus more highly feared. The parent form of these two species causing human trypanosomiasis is *T. brucei*, not infective for man, but considered the most virulent of all members of the genus. It causes *nagana*, a highly fatal disease of horses, mules, donkeys, camels, sheep and goats, and a mild infection in cattle. So terrible is this condition in man's chief domestic animals that human inhabitation of vast areas of Africa is thereby impossible.

The three species, *gambiense*, *rhodesiense*, and *brucei* cannot be distinguished on morphological grounds and some parasitologists consider them all one species, or as no more than varieties of one. *T. evansi*, transmitted by horseflies, causes *surra* in horses, mules, dogs and camels in India, and is also highly fatal. *T. equiperdum*, in horses, causes *dourine*. This species is especially interesting in that the insect generation has dropped out altogether, transmission being direct from horse to horse during breeding. It has become a venereal instead of an insect-borne disease.

T. cruzi, cause of Chagas' disease in Brazil and other parts of Latin America, is transmitted by blood-sucking bugs of the family Reduviidae. Rodents, opossums and armadillos are the natural hosts, but this trypan can infect a long list of mammals and lizards. The human disease is serious and often fatal, attacking the heart muscle among many other organs. No cure is known. *T. rangeli* is a non-pathogenic parasite of the middle Americas, transmitted through the bite of *Rhodnius*, another reduviid bug. It infects man and a number of other mammals.

In our next installment we shall consider tsetse flies, the vectors.

Book Reviews

(Reviews of text books on general zoology continued from the November issue of *Nature Magazine*.)

General Zoology, by Mary J. Guthrie, Wayne State University, and John M. Anderson, Cornell University. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, 1957. Pp. xv, 708; figs 388, frontis., colored fold-out flow chart for cell metabolism. $7.50.

An outgrowth of four editions of University of Missouri text by Curtis and Guthrie, preserving same philosophy of presentation, but essentially a new text, with changes in organization, new emphases, extensive revision. Plan excellent; principles applied first to cells, then vertebrates, then various systems thoroughly covered, followed by reproduction, development, heredity, variation; includes experimental results and biometrical methods. Chapter on taxonomy followed by survey of invertebrates, concluding with novel chapter on systems and functions of invertebrates collectively. Finally, ecology and evolution. Cell structure as revealed by electron microscope compared to classical concepts with light microscope. Writing is expert and challenging, graded upward. Illustrations of classical type, but very fine. Integration excellent. Student is told what is not known along with that which is; authorities and references fully cited.

College Zoology, by Robert W. Hegner, late of Johns Hopkins University, and Karl A. Stiles, Michigan State College. The Macmillan Co., 60 Fifth Ave., New York 11, 6th ed., 1951. Pp. xii, 911; figs., frontis. in color, 473. $6.50.

Dr. Stiles, experienced in bookmanship, took over one of America's best known texts following death of senior author. Revision thorough, many chapters rewritten, new material added, yet original plan of this, foremost exposition of systematic method of presenting zoology, unchanged. Author, in preface, explains his reasons for regarding this method as still the best. Following an introduction, 29 chapters on animal kingdom, then 8 on physiology, reproduction and development, heredity, ecology, distribution, evolution, and history of zoology, these topics necessarily receiving brief treatment. Illustrations of classical type, good, more than 300 new line drawings. Glossary gives both pronunciation and derivation along with definition. Good revision of a book that has been in use since 1912.

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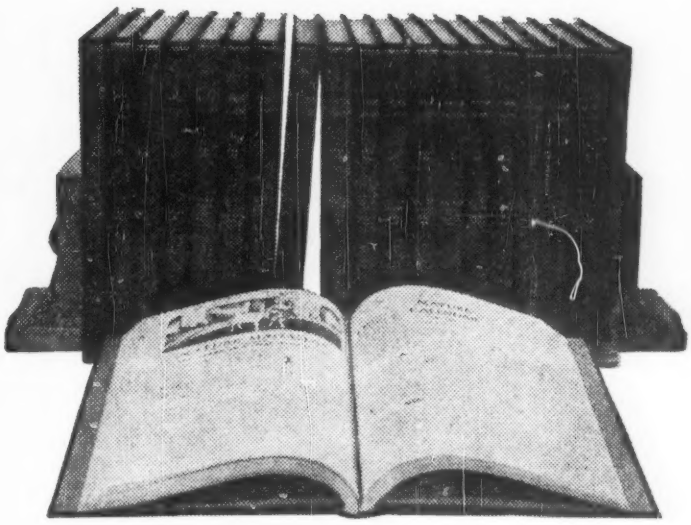

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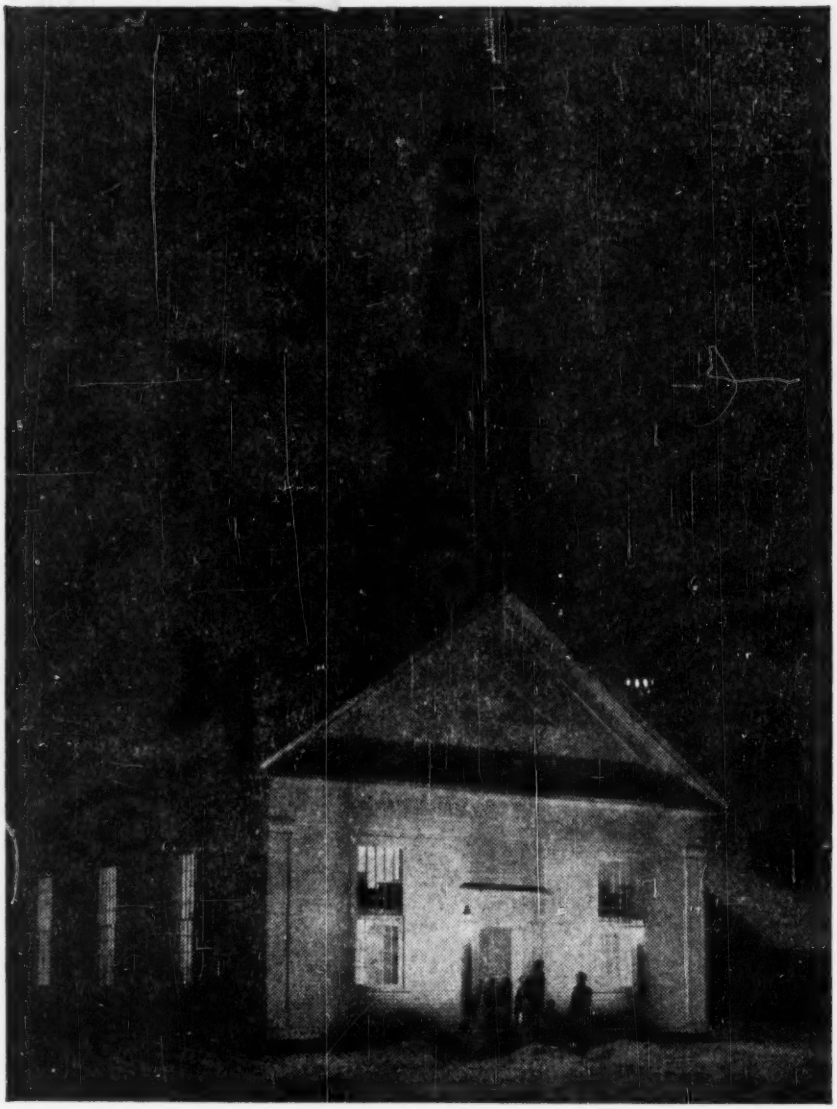

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